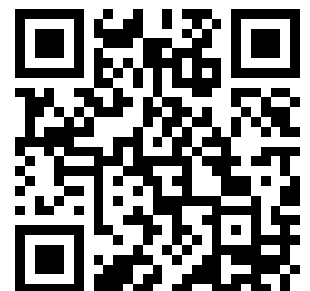

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Eighth Annual Edition

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Part III

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Products are usually indexed under the main noun (Fire Brick, for example, being indexed as Brick, Fire) except where common usage makes it desirable to have the adjective precede the noun, as, for instance, Gas Producers, Metal Lath, etc.

Trade names (shown in italics) follow the firm names listed under the various products except where such trade names would appear simply as an unnecessary repetition of the preceding firm names without giving any additional information.

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 General Electric Co.....728-749
 See also pages.....532-533

Wood Blocks, Creosoted
 See Blocks, Wood Flooring and Paving, Creosoted or Treated.

Wood Blocks, Natural
 See Blocks, Wood, Flooring and Paving, Natural.

Wood Pipe
 See Pipe, Wood.

Wood Preservatives
 See Preservatives, Wood.

Woodworking Machines — Combination Saw, Jointer, Sander, Emery Wheel and Drill
 Buffalo Forge Co.....868

Wrenches, Alligator
 See pages56-57; 398

Z

Zinc Roofing
 See Roofing, Zinc—Corrugated, V-crimped or Flat.

Zinc Sheets—Corrugated, V-crimped or Flat
 See Sheet Metal, Zinc.

Zinc Work
 See Ornamental Metal Work; Sheet Metal Work.

Only products described or illustrated are indexed under the firm name and page number.

Articles merely mentioned (neither described nor illustrated) are indexed under their proper headings by page number only.

THE FOUNDATION COMPANY

120 Liberty Street
NEW YORK, N. Y.
BRANCH OFFICES

CABLE ADDRESS
"UNDERFOUND"

ATLANTA, GA., Hurt Building
BUENOS AIRES, ARGENTINA, Oficina 523, Sarmiento 643
CHICAGO, ILL., Rookery Building
LIMA, PERU, Rifa 532
LOS ANGELES, CAL., Higgins Building
MEXICO CITY, MEXICO, Apartado 1318
MONTREAL, QUE., 222 St. James Street

NEW ORLEANS, LA., Maison Blanche Building
PARIS, FRANCE, 16 Rue de la Pepiniere
PHOENIX, ARIZ.
PITTSBURGH, PA., Fulton Building
PORTLAND, ORE., 1125 Yeon Building
RIO DE JANEIRO, BRAZIL, Caixa do Correio, 109
SAN FRANCISCO, CAL., Holbrook Building

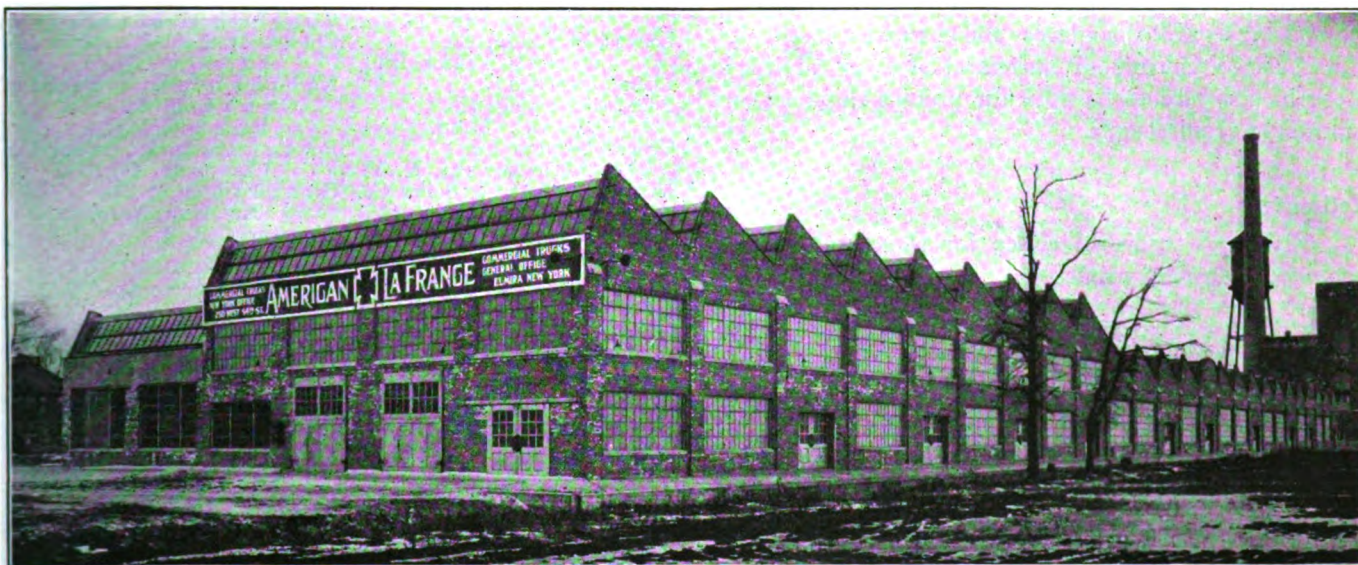
TAMPICO, MEX., Apartado 44

Services

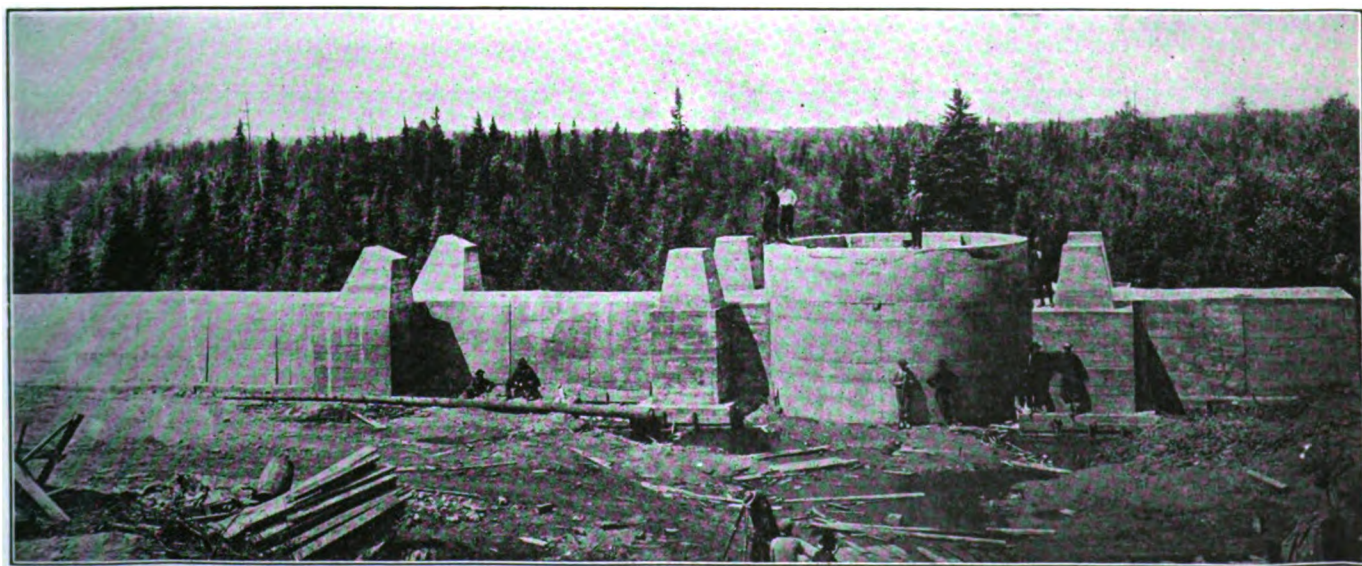
THE FOUNDATION COMPANY is widely experienced in the construction of industrial plants, steam and hydro-electric power plants, railroads, refineries, water supply and sewage systems, river and harbor works, and other types of engineering construction. The company specializes in the design and construction of difficult sub-aqueous work such as deep foundations, bridge piers,

mine shafts, tunnels and the like involving the use of either pneumatic or open caissons.

Affiliated with THE FOUNDATION COMPANY is The Foundation Oven Corporation, designers of the "American Coke Oven" and builders of complete by-product coke oven plants. A coal research laboratory is maintained in New York by this organization.



FACTORY AND POWERHOUSE FOR THE AMERICAN-LA FRANGE COMPANY AT BLOOMFIELD, N. J.
Money was saved due to the experience of THE FOUNDATION COMPANY



NORTHLAKE IRON MINE SHAFT FOR THE CLEVELAND CLIFFS IRON CO., ISHPERING, MICH.
24 ft. in diameter and 77 ft. deep. Sunk by the pneumatic caisson method by THE FOUNDATION COMPANY

KENWOOD BRIDGE COMPANY

Fabricators of Structural Steel; Engineers and Contractors for Complete Industrial Plants

TELEPHONE
RANDOLPH 1488

1416 First National Bank Building
CHICAGO, ILL.

Products and Services

DESIGNERS, ENGINEERS and BUILDERS of complete INDUSTRIAL PLANTS.

STRUCTURAL STEEL for buildings, roofs, bridges, tanks, and coal and ore handling structures.

Facilities

The shops of the KENWOOD BRIDGE COMPANY are completely equipped with modern facilities for fabricating all classes of structural steel work promptly, under supervision of skilled engineers and competent mechanics.

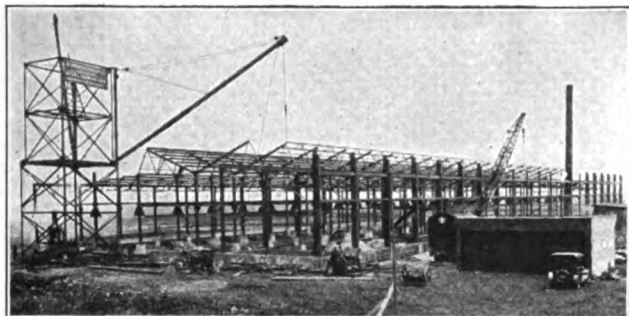
A large tonnage of structural steel is carried in stock in our yard to be used for prompt shipment and immediate requirements.

Estimates

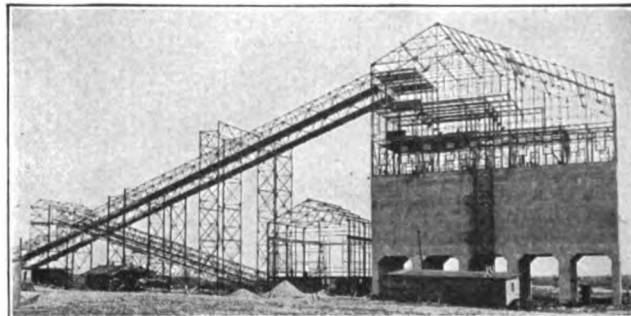
Estimates furnished either for structural steel or complete industrial plants.

Partial List of Representative Structures Built by This Company

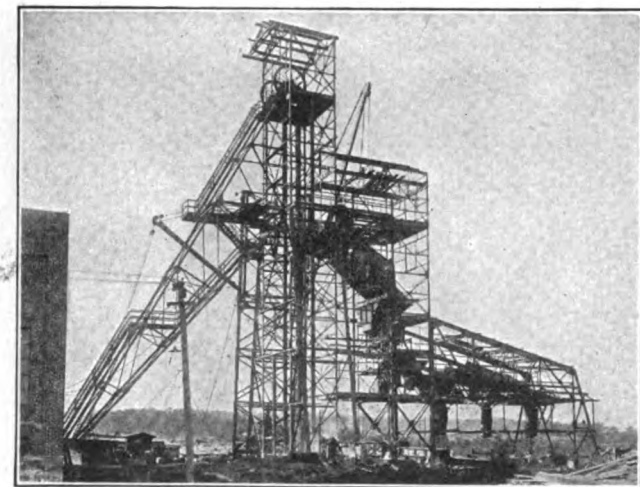
CHICAGO, ILL.	
American Steel Foundries	Morton Salt Co.
Madison Coal Corp.	Union Drop Forge Co.
Southern Gem Coal Corp.	Bates Expanded Steel Truss Co.
Brownell Improvement Co.	
AURORA, ILL.	HARVEY, ILL.
Western Wheeled Scraper Co.	Austin Mfg. Co.
HEGEWISCH, ILL.	Buda Co.
Ryan Car Co.	Ingalls-Shepard Forgings Co.
LA SALLE, ILL.	KENSINGTON, ILL.
Marquette Cement Mfg. Co.	Sherwin-Williams Co.
PULLMAN, ILL.	ROCKFORD, ILL.
Pullman Co.	Greenlee Bros. & Co.
BEDFORD, IND.	WEST PULLMAN, ILL.
Consolidated Stone Co.	Carter White Lead Co.
INDIANA HARBOR, IND.	Chicago Malleable Castings Co.
Inland Steel Co.	MASON CITY, IOWA
Standard Forgings Co.	Northwestern States Portland Cement Co.
LANSING, MICH.	PETOSKEY, MICH.
General Motors Co.	Petoskey Portland Cement Co.
NORTH TONAWANDA, N. Y.	CLEVELAND, OHIO
Niagara Radiator & Boiler Co.	Grasselli Chemical Co.
HOUSTON, TEX.	KENOSHA, WIS.
Texas Co.	Simmons Co.
	RACINE, WIS.
	J. I. Case Threshing Machine Co.



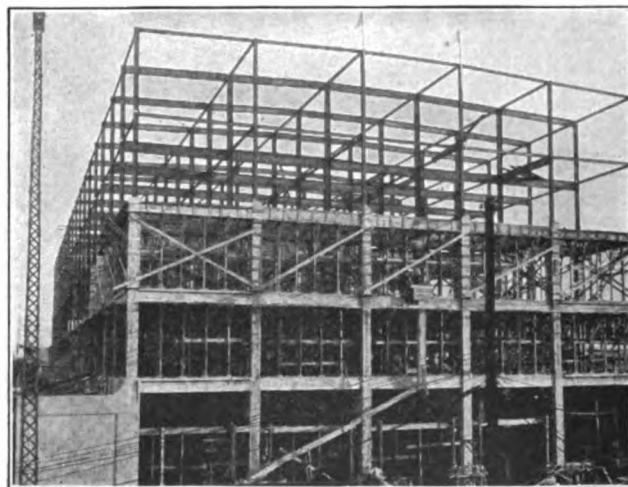
132x400-FT. FOUNDRY BUILDING BUILT FOR NIAGARA RADIATOR Co., CHICAGO, ILL.



STONE CRUSHING PLANT BUILT FOR DOLESE & SHEPARD Co., GARY, ILL.



COAL TIPPLE BUILT FOR MADISON COAL Co., CAMBRIA, ILL.



100x600-FT. WAREHOUSE BUILT FOR SIMMONS Co., PHILADELPHIA, PA.

DAVID W. MORROW

Consulting Engineer

4500 Euclid Avenue
CLEVELAND, OHIO

Product

THREE-WAY SYSTEM OF FLAT SLAB FLOOR CONSTRUCTION (Patented).

Three-way System

In this system the columns in alternate rows are opposite each other, and in adjacent rows are staggered with respect to each other, so that any group of four adjacent columns is located at the corners of a parallelogram, in which the four sides and the short diagonal are of equal length.

The reinforcing steel over the column head is placed in three layers, and extends in three general directions, radiating into the surrounding slab and extending over the six adjacent surrounding columns, all of which are equidistant from the central one.

Advantages—The system of reinforcing gives additional strength and saves labor and material, and the arrangement of columns gives a much better distribution of floor space.

All the reinforcing rods are lapped over the column head, the distance center to center of columns is the same in all directions in which the reinforcing extends, and the floor space falling over each group of rods is the same, hence the rods for all the interior panels will be of the same size and length. This is a decided advantage in ordering, handling and placing material.

90.7% of the panel area is uniformly distributed around the column, as compared to 78.54% of the panel area in the square panel formation. Furthermore, the 9.3% of un-uniformly dis-

tributed panel area of the Three-way system is divided into two parts located in different parts of the panel, whereas the 21.46% of un-uniformly distributed area of the square panel is located at one point. The better distribution of panel area in the Three-way system gives additional strength and also saves reinforcing steel.

The column arrangement used eliminates sharp turns, making unusually easy the running of vehicles through the building, and facilitating the free movement of overhead carriers handling long materials.

Applications of the Three-way System

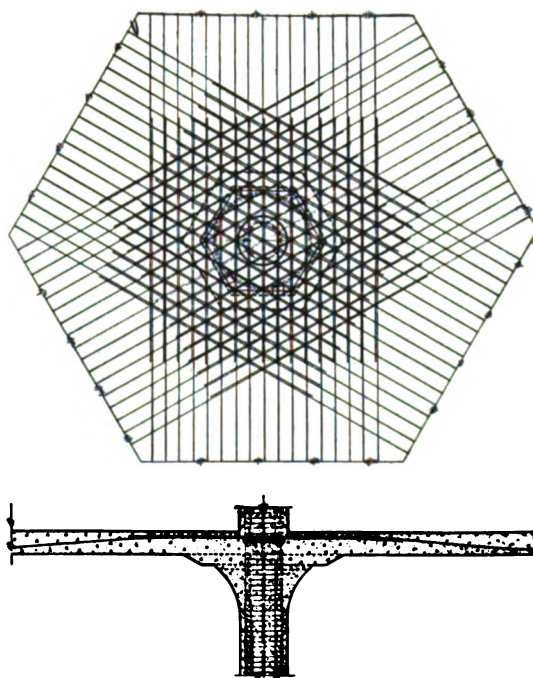
This system is particularly serviceable wherever fireproof construction is desired, such as in factories, warehouses, storage buildings and garages, and also for roofing over underground reservoirs, such as those used in connection with water filtering plants.

The arrangement of columns is especially well suited for garage purposes.

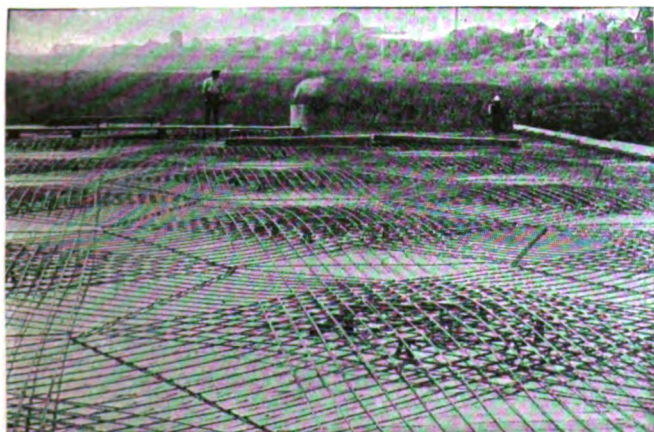
Licenses to Use the Three-way System

The United States and Canadian patents covering the Three-way system are owned by DAVID W. MORROW.

Licenses to use the Morrow Three-way system in the United States and Canada will be granted subject to terms and conditions which will be explained on request.



PLAN AND SECTION, REINFORCING OVER COLUMN HEAD



GENERAL VIEW OF REINFORCING IN THE THREE-WAY SYSTEM



INTERIOR VIEW OF BUILDING WITH FLOORS BUILT ON THE THREE-WAY SYSTEM
Showing advantageous arrangement of columns

E. W. BLISS CO.

Manufacturers of Special Machinery

MAIN OFFICES

BROOKLYN, N. Y.

SALES OFFICES

CHICAGO, ILL., Peoples Gas Building
CLEVELAND, OHIO, Cleveland Discount Building
BUFFALO, N. Y., Marine Bank Building
NEW HAVEN, CONN., Second National Bank Building

DETROIT, MICH., Dime Bank Building
CINCINNATI, OHIO, Union Trust Building
ST. LOUIS, MO., Boatmen's Bank Building
PITTSBURGH, PA., Oliver Building

AMERICAN FACTORIES

BROOKLYN, N. Y.

HASTINGS, MICH.

CLEVELAND, OHIO

SALEM, OHIO

FOREIGN SALES OFFICES AND FACTORIES

LONDON, ENGLAND, Pocock Street, Blackfriars Road, S. E.

PARIS, FRANCE, 100 Boulevard Victor-Hugo, St. Ouen

BIRMINGHAM, ENGLAND, Norwich Union Chambers

Products

SPECIAL MACHINERY of all types and sizes.
For Bliss Standard Machinery, see pages
866-867.



Machinery ranging from the smallest bench and precision lathes to the largest boring mills, planers, grinders, etc. We have planers with capacities up to 12x10x26 ft., lathes up to 60-in. swing and 25-ft. centers.

Facilities

The E. W. BLISS Co. has been building special and standard machinery for 65 years. Our striking success in building machines of widely varied character is due to long experience and an organization with unparalleled facilities and resources.

Pattern shops, foundries with capacity for single castings up to 60 tons and combined daily capacity of 300 to 400 tons.

Welding, grinding, heat treating and all other necessary departments.

Personnel

The personnel comprises:

A staff of engineers qualified by long years of service in special machinery production.

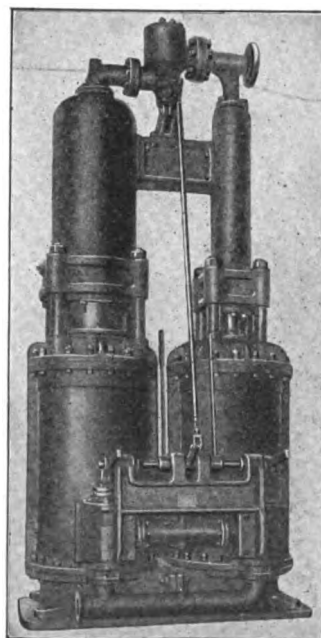
Mechanics trained to the finest and most intricate work and to unusually close tolerances—we make the United States torpedo in which the gyroscope is an example of the utmost refinement.

Mechanics trained to handle the big, broad requirements of machines weighing 300 tons and upward, where unusually close tolerances are not required.

Equipment

The equipment includes:

Five complete plants so located as to provide quick access and deliveries to all the great Eastern and Middle Western centers of industry. -



HYDRAULIC EQUIPMENT

Service

Our Engineering Department is ready to confer upon any production or economy problems involving special machinery and will gladly give prompt estimates.

Special Machinery

For many years we have been developing, designing and building special machinery of various kinds, machine parts and tools, not only for our own use, but also for a big list of customers who early discovered the fact that we could do these things better and at less cost than themselves.

We can build machines, parts of machines, tools, jigs, dies and fixtures to specifications, economically and quickly.

We have men and machinery for the finest small work and men and machines for producing the most massive machines.

ART METAL CONSTRUCTION COMPANY

Steel and Bronze Interior Equipment

GENERAL OFFICES AND FACTORIES

JAMESTOWN, N. Y.

BRANCH OFFICES

BALTIMORE, MD., 120 West Fayette Street
 BIRMINGHAM, ALA., 1020 Jefferson County Bank Building
 BOSTON 9, MASS., 69 Federal Street
 BUFFALO, N. Y., 11 South Division Street
 CHICAGO, ILL., 434 South Wabash Avenue
 CINCINNATI, OHIO, 2003 Union Central Life Building
 CLEVELAND, OHIO, 1900 East 13th Street
 DALLAS, TEX., 1309 Great Southern Life Building
 DETROIT, MICH., 1049 Book Building
 HARTFORD, CONN., 222 Pearl Street

INDIANAPOLIS, IND., 1012 Merchants Bank Building
 KANSAS CITY, MO., 102 Scarritt Building
 MINNEAPOLIS, MINN., 627 Plymouth Building
 NEW YORK, N. Y., 369 Broadway
 PITTSBURGH, PA., 322 Oliver Building
 PORTLAND, ME., 19 Temple Street
 SALT LAKE CITY, UTAH, 602 Deseret Bank Building
 SEATTLE, WASH., 207 Central Building
 WASHINGTON, D. C., 336 Southern Building
 ALBANY, N. Y., 90 State Street

LONDON, E. C. 1, ENGLAND, 58 Holborn Viaduct

Products

Originators and world's largest makers of complete EQUIPMENT in STEEL and BRONZE for Banks, Libraries, Public Buildings, Commercial and Insurance Offices, designed from architects' details and specifications.

Bank Furniture and Fixtures, Cages, Counter Screens, Desks, Doors, Filing Cabinets and Devices, Bookstacks, Library Fixtures, Grilles, Omnibuses, Partitions, light weight Safes, Screens, Shelving, Stairways, Tables, Trim, Vault Fittings, etc.

Art Metal Steel Planfile

The introduction of the Art Metal Planfile in 1915 provided the first successful means of filing large size papers, blue prints and drawings vertically. Vertical filing is the one logical way of storing papers of any sort for easy and continuous reference.

The Art Metal Steel Planfile is built of high grade furniture steel in either single or double wall construction. In the double wall Planfile an asbestos interlining



TRADE-MARK

of contact with the walls of the Planfile.

The Planfile Compression System—

Compression, as applied in the Art Metal Planfile is the only successful method by which individual cloth or tissue tracings, blue prints and sketches can be placed in an indexed folder and positively held perfectly flat and smooth in a vertical position without the inconvenience of fastening them at the top.

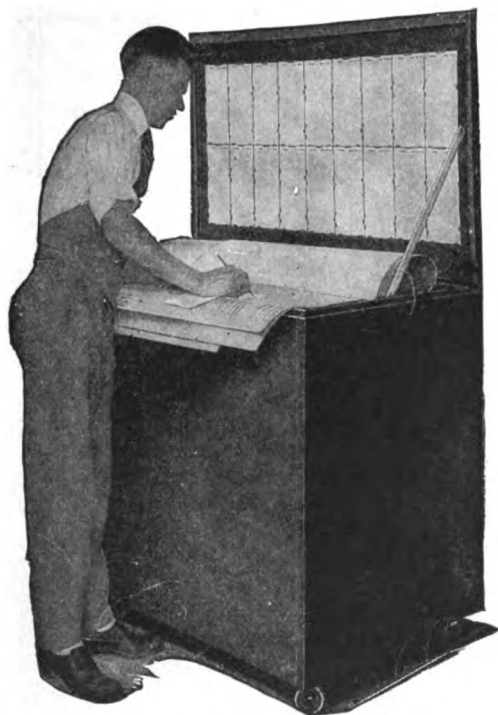
The accompanying drawing shows paperoid folders, double folded at the top for easy handling. These contain the filed material and are firmly held in position on either side by six or nine compressions springs, depending on size of planfile. The folders are easily slipped into place or withdrawn for examination.

In the 18 pockets is room for 54 folders, giving a capacity for the Planfile of more than 5000 tracings.

Economy of Space Through Planfiles—

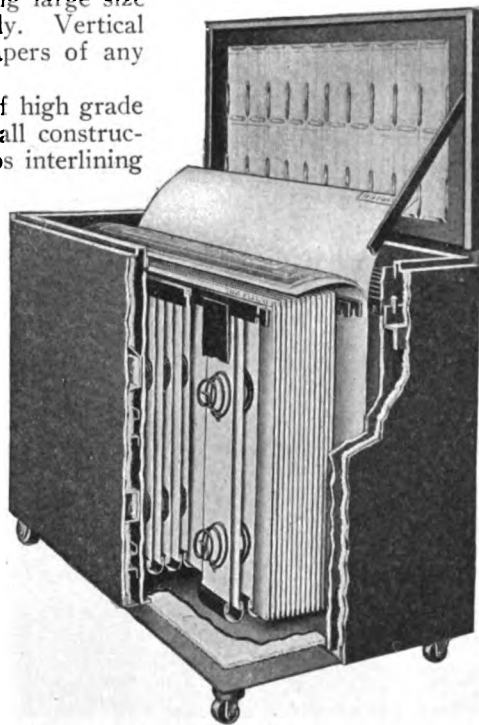
In addition to the great advantages of vertical over flat filing, Art Metal Planfiles effect a saving of from one-third to one-half in floor space, compared with flat drawer storage.

Not over 200 tracings can be stored and conveniently handled in a flat drawer. To equal the maximum capacity of one planfile it is necessary to stack 30 plan drawers to a height of 9 ft. 7 in., figuring 200 tracings to the drawer. And to operate plan drawers 30 to 40 in. of aisle space is necessary while the Planfile needs but 24 in. for complete facility of access.



THE ART METAL FULL SIZE PLANFILE

practically insures the protection of valuable blue prints, drawings, etc., from loss or damage by fire or water. This security is partly due to the unique compression system employed to keep the papers in a vertical position, which also keeps them out



SECTIONAL VIEW OF THE ART METAL FULL SIZE PLANFILE

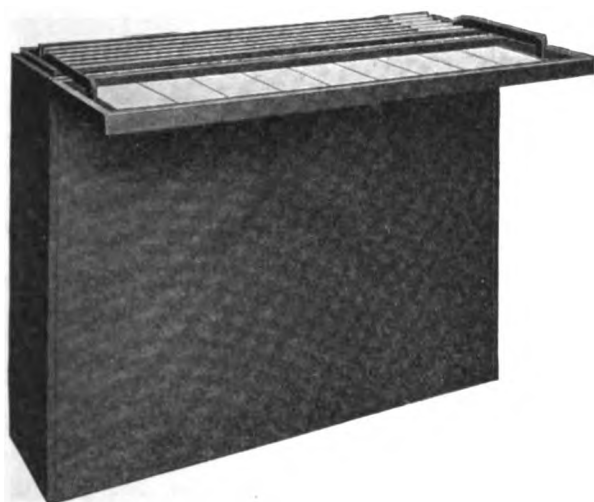
SPECIFICATIONS FULL SIZE PLANFILES

Style No.*	Number of pockets	Number of folders	Outside size, in.		
			Wide	High	Deep
S-3624	18	54	42	35 ¹¹ / ₁₆	30
S-3624-D	18	54	42	35 ¹¹ / ₁₆	30
S-4230	18	54	48	41 ¹¹ / ₁₆	30
S-4230-D	18	54	48	41 ¹¹ / ₁₆	30
S-4836	18	54	54	45 ¹¹ / ₁₆	30
S-4836-D	18	54	54	45 ¹¹ / ₁₆	30
S-5624	18	54	62	35 ¹¹ / ₁₆	30
S-5624-D	18	54	62	35 ¹¹ / ₁₆	30

*The first two figures of style number are the width and the last two figures are the height, of plans accommodated. The suffix "D" denotes double wall construction.

Art Metal Half Depth Steel Planfile

To meet special requirements we make a steel planfile with 7 pockets, fitted with 4 folders to the pocket—a total of 28 folders. If more or fewer folders are desired they are furnished to fit the requirements. The covers in this size open to the front to afford necessary working space while referring to the contents.



ART METAL HALF DEPTH STEEL PLANFILE
SPECIFICATIONS

Style No.	Number of pockets	Number of folders	Outside size, in.		
			Wide	High	Deep
S-3624½	7	28	42	31½	15
S-3624½-D	7	28	42	31½	15
S-4230½	7	28	48	37½	15
S-4230½-D	7	28	48	37½	15

The first two figures of style number are the width and the last two figures are the height of plans accommodated. The suffix "D" denotes double wall construction.

When casters are furnished add 4½ in. to height.

No casters furnished with half-size stock cases.

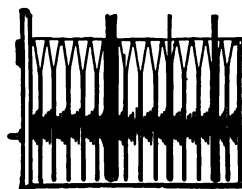
Art Metal Planfile Drawer Units

The Art Metal Planfile drawer units are composed of vertical filing units embodying the same compression system as the Art Metal Planfile already described. For the smaller tracings and drawings these units save from 65% to 90% in cost and two-thirds of the floor space required by the old way of subdividing plan drawers. These cases are regularly equipped with 4 folders per pocket.

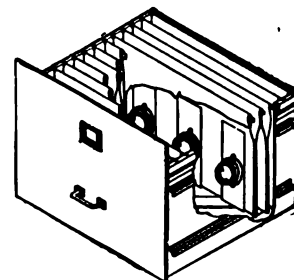
Planfile units range in size from the style No. 1177 illustrated above for drawings 8½x11 in. or less, to the style No. 1111 which will take drawings 24x18 in.

These units have drawers mounted on Amco roller bearing suspension, the standard suspension in Art Metal upright lines. In the larger sized drawers a double Amco suspension insures ample strength for the heaviest load.

The files illustrated below show units equipped with automatic general locks, which greatly increase the protection against fire and insure privacy.



Cross Section Showing
Folders Inserted in
Pockets



Cut-out View Showing Interior
Arrangement

DETAILS OF PLANFILE DRAWER UNITS

SPECIFICATIONS

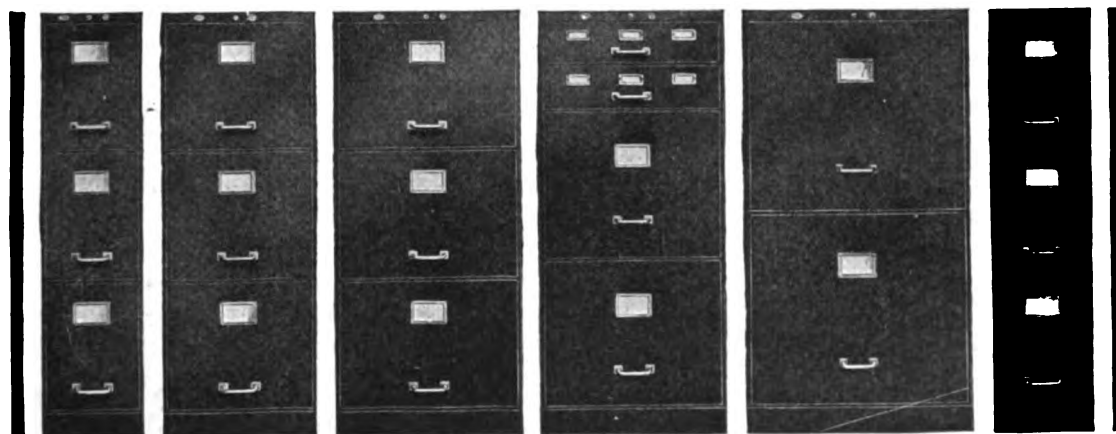
Style No.	Description	Outside dimensions without ends, in.			Clear filing space per drawer, in.		
		Width	Height	Depth	Width	Height	Depth
1127	Detachable ends.....	1	51½	24½	.....	.....	.....
1100	Three-drawer Planfile unit.....	11.88	51½	24½	10½	15½	23½
1102	Three-drawer Planfile unit.....	18.13	51½	24½	16½	15½	23½
1104	Three-drawer Planfile unit.....	21.94	51½	24½	20½	15½	23½
1106	Two-drawer Planfile unit Two three-compartment C. I. D.....	21.94	51½	24½	20½	17½	23½
1110	Two-drawer Planfile unit	27.82	51½	24½	26	23	23½
1176	Three-drawer vertical file for tariffs and letters. Equipped with compression guides...	11.88	51½	24½	10½	14½	22½

For Planfile Units with Automatic Locking Device specify odd numbers shown under illustrations. For example, Style 1100 with Auto Lock becomes Style 1101.

*Clear filing space in each compartment.

Some Art Metal Planfile Users

American Brass Co., Waterbury, Conn.
Baldwin Locomotive Co., Philadelphia, Pa.
Bethlehem Steel Corporation, Bethlehem, Pa.
E. I. duPont Powder Co., Wilmington, Del.
Ford Motor Co., Detroit, Mich.
New York Central Lines, New York, N. Y.
Interborough Rapid Transit Co., New York, N. Y.
General Electric Co., Erie, Pa., and Schenectady, N. Y.
Standard Oil Co., Elizabeth, N. J.
United States Rivers and Harbors Engineers Office, Washington, D. C., and Cincinnati, Ohio



No. 1127 No. 1101 No. 1103 No. 1105 No. 1107 No. 1111 No. 1177 No.
1127 No. 1100 No. 1102 No. 1104 No. 1106 No. 1110 No. 1176 1127

ART METAL PLANFILE DRAWER UNITS

THE PARAGON MACHINE CO.

Manufacturers of Blue Printing Equipment

77 South Avenue
ROCHESTER, N. Y.

Products

PARAGON BLUE PRINTING MACHINES and EQUIPMENT.

Uses

Making of blue prints, brown prints, Vandyke negatives, direct black prints, using either sheets cut to size of tracings or continuous rolls of paper.

Paragon Blue Printing Machine

Uniformly Lighted Printing Surface—The printing bed is constructed of polished plate glass $37\frac{1}{2}$ in. across (the length depending upon the size machine in which it is to be used) bent to a radius of 12 in., making a complete half cylinder. This is deep enough to accommodate the special blue print arc lamps so that all their light may be used direct without the use of reflectors, and also allowing the lamps to be placed far enough from the printing surface so that the light equalizes perfectly, producing an absolutely uniformly lighted printing surface.

These are all important points, as reflected light means wasted energy and expense, and uneven exposure would mean poor prints.

Perfect Contact—The apron is 2 in. wider than the rated capacity of the machine, which allows the making of full width prints without difficulty. It is driven from

make it second to none for low current consumption on a given amount of work.

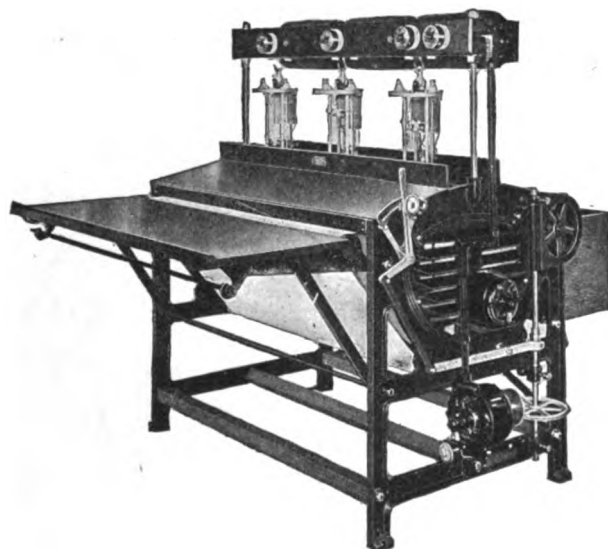
The drive and speed controlling mechanism are most efficient and also the extreme of simplicity.

There are no belts or chains, or other appliances easy to get out of order on the Paragon. The range of speed is ample for all classes of work. A reliable constant speed motor is used. All changes in the speed of the machine are made instantly through a noiseless drive giving any speed from 6 lin. in. to 20 lin. ft. per minute. This is greatly appreciated by those who desire to make direct black line, sepia or blue line prints.

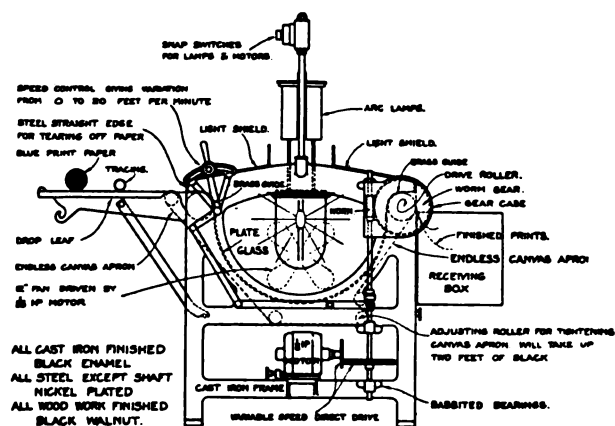
Conformity to Underwriters' Regulations—The drive mechanism is self-contained, being a part of the machine enclosed and guarded so as to comply with the strictest factory regulations.

The Paragon machines are wired complete in the most approved and advanced manner, complying with all underwriters' regulations.

Regular Equipment—The machines, unless otherwise ordered, are furnished with complete equipment, which includes in the 42-in. machine: 3 special high power blue printing arc lamps, the $\frac{1}{8}$ h.p. drive motor and a small motor direct connected to the ventilating fan. The 54-in. machines are equipped with 4 arc lamps, the $\frac{1}{8}$ h.p. drive motor and fan motor. Snap switches are provided for the motors and 1 switch for each lamp. These are located on the box directly in front of the operator, so that the use of one or more lamps can be discontinued when making narrow prints. This box also contains the fuse cut-outs for the lamps and motors.



PARAGON BLUE PRINTING MACHINE



CROSS SECTION OF PARAGON BLUE PRINTING MACHINE

the rear of the semicylindrical glass, giving an action similar in many respects to a band brake, pressing every particle of air from between the tracings and sensitized sheet. This gives the excellent contact for which the Paragon is famous. It is positively guaranteed that there is no machine in existence which can surpass the Paragon on this feature—contact.

Speed—As the Paragon now stands it is the fastest in existence, with such a high rate of efficiency as to

Paragon Print Drying Machines

The construction of the machine consists of a smooth steel heated cylinder, supported on ball bearing journals. It is driven by means of variable speed device directly connected to an electric motor, which allows any desired speed between 0 and 10 ft. per minute. No belts or chains are used in driving Paragon equipment.

Heat source for the cylinder may be gas, electricity

or steam, the machine necessarily being constructed for one or the other at the factory. The machine is so constructed that proper combustion is obtained in the gas heated dryer without the use of a blower.

A canvas apron is carried upon a series of steel



PARAGON PRINT DRYING MACHINE

rollers so arranged as to bring the apron in tight contact with surface of the steel drying cylinder. This apron is kept taut by a steel roller, the weight of which gives uniform tension regardless of the variation in heat and dampness.

A special device is provided for transferring prints from the bath trays to the dryer. Small prints or prints of any length whatever, and of any width up to the rated capacity of the machine, are handled with equal ease.

How Operated—The prints are fed to the apron at one side of the machine and are carried by it into contact with a heated cylinder. The prints are fed from the wash trays to the dryer without the necessity of wringing. The apron holds the paper in direct contact with the heated cylinder until the prints are delivered perfectly dry on the opposite side of the machine. Stripper fingers are provided for automatically running the prints from the heated cylinder and depositing them upon a sorting table, which should be provided at the rear of the machine to receive them.

PARAGON BLUE PRINTING EQUIPMENT

Size, in.	Prices					Floor space, in.			
	Printer		Dryer			Printer		Dryer	
	D. C.	A. C.	Gas heated	Electric heated	Steam heated	Wide	Long	Wide	Long
30			\$350.00	\$400.00	\$450.00			28	44
42	\$725.00	\$750.00	375.00	425.00	475.00	54	54	28	56
54	925.00	950.00	400.00	450.00	500.00	54	66	28	68

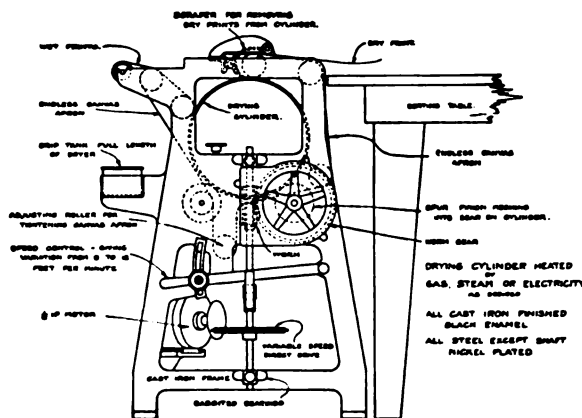
Note—All machines electrically driven.
Catalogues and Prices—Prices are subject to change. Always write for latest complete catalogue B and prevailing prices.

Space Requirements—The Paragon print drying machine here described has been built to meet the need of some method of drying various sized prints in separate sheets of any length, without the necessity of hanging them or constructing ovens with racks and lines in them or other makeshift apparatus. This also permits prints to be washed for any desired length of time without interrupting either the printing or drying process.

The area required to hang up the quantity of prints

that the Paragon dryer will dry and iron would be so large as to put it out of the question entirely. The Paragon requires but 8 sq. ft. of floor space.

Scope of Use—The 30-in. capacity Paragon print dryer is intended primarily to dry photographic prints



CROSS SECTION OF PARAGON DRYING MACHINE

and will dry photostat, rectigraph and regular photographic prints perfectly.

Print Paper Cabinets

Cabinets are constructed of oak and carefully made and well finished; the partitions are removable so that either cut sheets of paper or continuous rolls can be accommodated. The cabinet is of great convenience to the operator of the blue printing machine as all sizes and weights of paper are near at hand and quickly accessible.

Cabinet for 42-in. blue printing machine.....\$150.00
Cabinet for 54-in. blue printing machine..... 200.00

Washing Trays and Trimming Tables

These are constructed entirely of oak except the corners, which are cast iron, and are filled and varnished to withstand severe use. The legs and table tops are removable to facilitate shipping and moving.

WASHING TRAYS AND TRIMMING TABLES

Trays (Height, 34 in.)		Tables	
Inside dimensions, in.	Price	Top dimensions, ft.	Price
36x36x6	\$25.00	4x4	\$45.00
36x48x6	30.00	4x6	50.00
36x60x6	35.00	5x5	50.00
48x48x6	40.00	5x7	60.00
48x60x6	45.00		
60x60x6	50.00		

Installation of Equipment

A receiving box is furnished with the printer which adds 12 in. to the length, but eliminates the use of a table, thus allowing the equipment to be used in smaller quarters. The receiving table, however, allows the work to be handled more rapidly.

Send a sketch showing dimensions of blue print room and a diagram showing the proper layout for equipment will be forwarded.

Further information on the subject will be gladly furnished on request.

Supplies and Equipment

Every requisite for the draftsman and engineer in field or office. Price and delivery on application.

THE C. F. PEASE COMPANY

Blue Printing Machines, Drafting Room and Engineers' Supplies

TELEPHONE
SUPERIOR 9475

840 North Franklin Street, corner Institute Place
CHICAGO, ILL.

CABLE ADDRESS
"PEASECO, CHICAGO"
Codes Used: ABC,
Hentley and Private

Products

BLUE PRINTING SUPPLIES and ACCESSORIES, which include: Blue Printing Machines; Washing and Drying Machines, single sheets and continuous; Blue Print Paper Sensitizing Machines; Blue and Brown Print Paper and Cloth, sensitized and unsensitized; Blue Print Room Requisites.

DRAFTING ROOM FURNITURE and SUPPLIES of all kinds; DRAWING INSTRUMENTS and MATERIALS of every sort; all leading brands of TRACING CLOTHS.

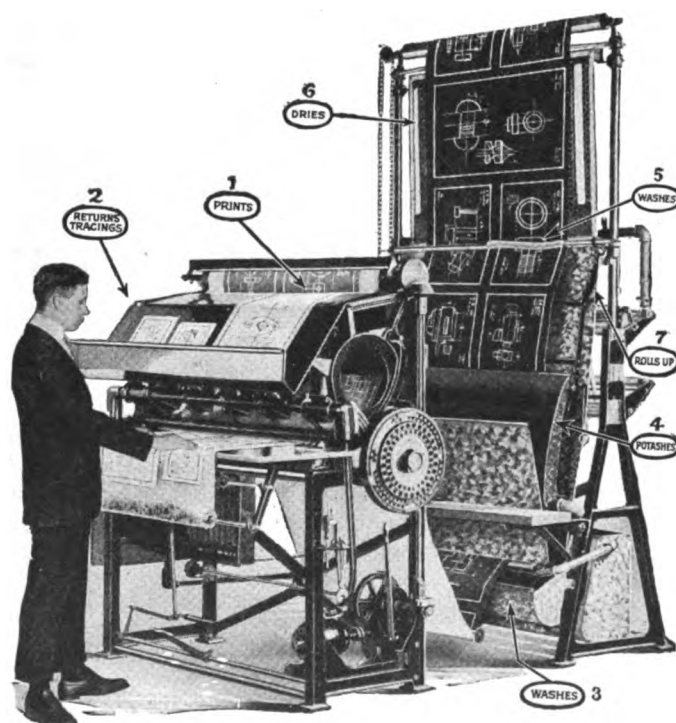
SURVEYING INSTRUMENTS and FIELD SUPPLIES.

Pease Continuous Blue Printing Equipment

Saves Labor—One boy and a Pease Peerless automatic continuous blue printing equipment can print, wash and dry more and better blue prints than four experienced men can turn out with any other equipment using independent methods of washing and drying.

Prints, Washes and Dries—A Pease Peerless will print, wash and dry up to 100 yds. of perfect blue prints every hour at any hour of the day or night, and do it at a lower cost per square foot of finished blue print than is possible by any other method. Each operation—printing, washing and drying—is automatic and continuous.

Economical for Short Runs—Short runs of 5 or 10 minutes are just as economically done by an operator who has other duties to perform.



PEASE AUTOMATIC CONTINUOUS BLUE PRINTING MACHINE
Prints, washes and dries perfect blue prints at the rate of 100 yards an hour

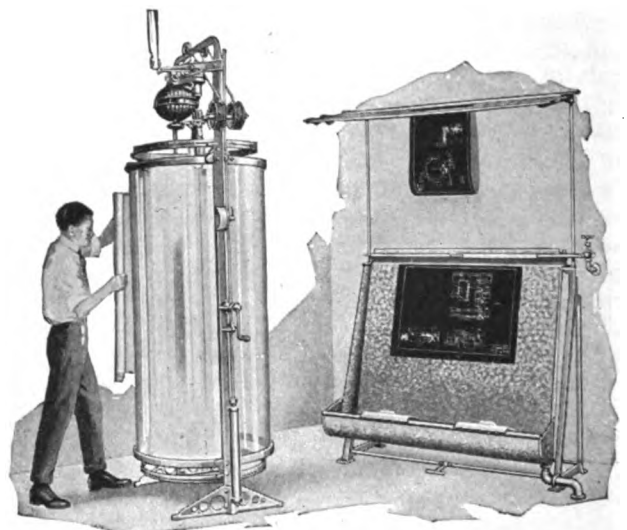
Where Used—More than 1200 Pease automatic continuous blue printing machines are in use in the drafting rooms of engineers, architects, industrial plants, railroads, government offices, shipyards and commercial blue printers.

Independent Units—The Pease Peerless blue printing machine may be purchased as an independent unit, if desired, and the washing and drying machine can be added later, although the greatest economy is effected by installing the complete equipment.

Catalogue—Catalogue No. B-40 contains the information wanted about this drafting room labor saver.

Pease Vertical Blue Printing Machine

In those drafting rooms where the demand for blue prints does not warrant the purchase of a Pease Peerless automatic continuous blue printing equipment, the Pease vertical blue printing machine and sheet washer will furnish perfect blue prints or negative prints of moderate size. The Pease vertical can be installed in a corner of



PEASE VERTICAL ELECTRICAL BLUE PRINTING MACHINE AND
PEASE SHEET WASHER

the drafting room and will furnish a constant supply of blue prints whether the sun shines or not.

The contact on the Pease vertical, due to the patented self-adjusting and self-stretching curtain, is practically equal to that produced by a vacuum frame. Pease vertical machines are equipped with Pease Universal lamps, which print as fast as any other blue print lamp on the market and use 50% less current.

The 5 sizes and moderate prices are given in Catalogue No. B-40 which will be sent on request.

Blue Printing Supplies

THE C. F. PEASE COMPANY manufactures everything used in blue print making, from the smallest sun frame and bath tray to the Peerless continuous electric automatic printing, washing and drying machine.

Drawing Instruments Made in America

Pease "Chicago Made" drawing instruments are made for those discriminating engineers and draftsmen who place quality and accuracy above price. The experts who designed Pease "Chicago Made" instruments and who supervised their construction have made drawing instruments in the oldest factories of Europe and America. They studied every detail of every instrument on the market and built the Pease instruments with only one object in mind—to make them superior in accuracy and mechanical detail to any other line of instruments on the market. Each piece is given the finest



SPRING
HINGE PEN



COMPLETE SET OF PEASE "CHICAGO MADE" DRAWING INSTRUMENTS IN GENUINE MOROCCO CASE
Smaller sets equally well made and lower priced are shown in catalogue "D-21"

finish obtainable, and then complete sets of various assortments are packed in genuine morocco pocket-style cases.

For those who desire a lower priced set, we make the Pease-Franklin drawing instruments, which are equally accurate; are made with the same dies and the same construction, but are packed in imitation leather cases and are not as highly polished. You may have literature and prices on both. Just write for catalogues "D-21" and "F-D-21."

Sensitized Papers and Cloths

"Veri-Strong," "Royal," "Puritan," and "Superior" blue print papers and "Perfection" blue print cloths are of highest quality stock and carefully sensitized in 5 different printing speeds. Coating is done only after receipt of customer's order and goods shipped same day.

"Perfection" brown process papers and cloths are also unexcelled. Every roll guaranteed freshly coated, full length and continuous. Full credit allowed on any goods found unsatisfactory and properly returned.

Drawing Papers and Cloths

Pease drawing, detail, and tracing papers and cloths are unsurpassed. Sample books or working sample will be cheerfully furnished on request. Every effort is made to meet detail requirements.

Printed sheets of tracing paper and cloth (cut to required sizes) with customer's titles and appropriate borders are furnished on order.

T-squares, Triangles and Scales

A full line, both wood and celluloid. All sizes and qualities carried in stock. Also slide rules for every calculation required by the engineer.

Drafting Room Furniture

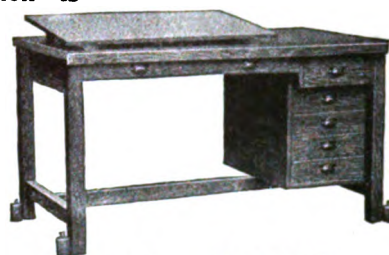
The Pease line of drafting room furniture and engineer's office equipment is very complete. It includes both steel and wood, sectional and vertical filing cabinets in several sizes; drawing tables with and without drawers and draftsmen's stools of steel or wood.

Particular attention is called to a vertical plan safe, made of steel, which makes a dustproof container for blue prints, drawings, maps, plates, etc.

Write for Catalogue F-21 which illustrates the complete line of furni-



PEASE TABLE No. B-02253



PEASE TABLE No. B-02259



Wood Cabinet Nos.
B-02270 and B-02271



Steel Cabinet Nos. B-02266
and B-02267

BLUE PRINT FILING CABINETS

ture, including drawing stands, drawing boards, ruling attachments, drafting machines and scales.

Surveying and Engineering Instruments

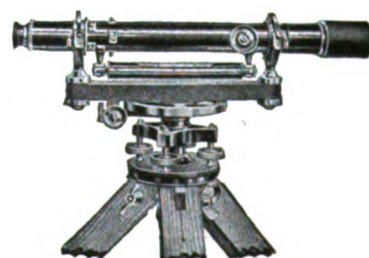
Levels and Transits—Several types of Buff & Buff, Berger, and Gurley levels and transits are carried regularly in stock. Instruments for both engineers and surveyors and for architects and builders can be supplied promptly if requirements are stated in first letter.



B-05185 CONVERTIBLE LEVEL

Leveling Rods—

We manufacture a very superior Philadelphia leveling rod, both heavy and light. Every rod carries both our name and guarantee. We also carry all accessories such as leveling rod ribbons, plumb bobs, hand levels, tapes, arrows, measuring chains, etc.



B-05183 ROAD BUILDER'S LEVEL

Tapes—Excellent deliveries can be made on the well-known makes of tapes such as the Chicago steel tapes, Chesterman and Lufkin (in all sizes and dimensions).

Catalogue B-40 Complete

Pease catalogue B-40, a 272-page cloth bound book, contains every blue print and drafting room requirement and many articles used by engineers, architects, surveyors and builders in field work. If you have not a copy for ready reference, write for one now.

WICKES BROTHERS

Manufacturers of Continuous Electric Blue Printing Machines

380 Water Street
SAGINAW, MICH.

SALES OFFICES

NEW YORK, N. Y., 501 Fifth Avenue

SEATTLE, WASH., 736 White-Henry Building

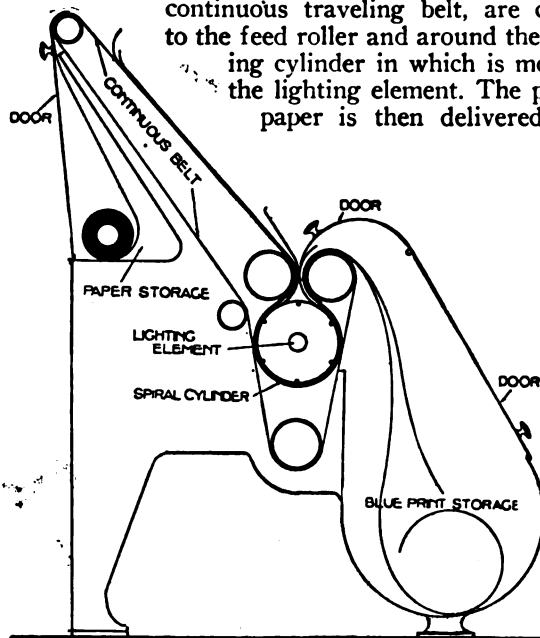
Products

WICKES CONTINUOUS ELECTRIC BLUE PRINTING MACHINES.

Also builders of Heavy Duty Tools for plate and structural steel, Heavy Duty Engine Lathes, Special Production Lathes and Crankshaft Turning Equipment.

Wickes Blue Printing Machines

Operation—The Wickes continuous electric blue printing machine will print separately cut sheets or continuous rolls in any length and in widths varying from 2 to 48 in. The paper and tracing are placed on a continuous traveling belt, are carried to the feed roller and around the printing cylinder in which is mounted the lighting element. The printed paper is then delivered to a



SECTIONAL ELEVATION OF WICKES BLUE PRINTING MACHINE

light-tight storage compartment and the tracing is returned to the operator or carried to the storage compartment, as desired.

The machine is entirely automatic, the only work required of the operator being the placing of the tracing and blue print paper on the traveling belt. The entire operating mechanism is controlled by snap switches located just below the paper storage compartment. The operator, without changing his position, can start, stop or vary the speed of the drive or operate the snap switch controlling the light. The speed of the traveling belt can be varied to suit any blue print paper.

Lighting Element—The light is obtained from a mercury vapor lamp of standard pattern. This lamp operates at a very low temperature and requires absolutely no attention from the operator at any time.

Printing Cylinder—The printing cylinder which surrounds the lighting element is composed of longitudinal and spirally disposed wires, woven right-handed on one side of the center of the machine and left-handed on the other side. The cylinder is stationary and the

tracing and blue print paper are carried around it by the traveling belt. The light is projected directly in a radial line through the tracing without having to pass through any intervening glass, the spirally disposed wires offering much less actual obstruction to the light than any glass cylinder would. The right- and left-handed spirally woven wires impart a very desirable ironing and spreading effect to the entire surface of the tracing.

The tracing and paper pass over 92% of the circumference of the cylinder.

Continuous Traveling Belt—The contact between the tracing and the paper is secured by means of a single, wide, continuous belt which passes around the feed rolls and the metallic printing cylinder. The tension of this belt is regulated automatically. Its life is guaranteed for three years' service.

Advantages of the Wickes Blue Printing Machine

Blue prints are made with an absolutely uniform tone throughout.

The operator is not required to work in a darkened room, the light-tight compartments making this unnecessary.

The operation of the machine is so simple that any person, however inexperienced, can make perfect prints with it.

There is no glass cylinder to clean, break or replace, our metallic cylinder being self-cleaning and unbreakable.

The power required is exceptionally low; the consumption when running at maximum capacity being but .015 kw. per sq. yd.

Model 10 Blue Printing Machine

The Model 10 machine has a capacity of 275 sq. yds. per 8-hour day. The lamp requires $3\frac{1}{2}$ amperes at 110 volts. The machine is entirely self-contained; is 30 in. high and requires a floor space of 2 ft. 6 in. by 5 ft.

Model 20 Blue Printing Machine

The Model 20 machine has double lighting elements and operates at twice the speed of the Model 10 machine, hence has twice the capacity. The construction is slightly heavier throughout.

Catalogues

Catalogues fully describing the Wickes blue printing machines will be sent on request.



WICKES CONTINUOUS ELECTRIC BLUE PRINTING MACHINE

PHOTOSTAT CORPORATION

Photographic Copying Machines

299 State Street

ROCHESTER, N. Y.

BRANCH OFFICES

BOSTON, MASS., 88 Broad Street
CHICAGO, ILL., 19 South La Salle Street
NEW YORK, N. Y., 7 Dey Street

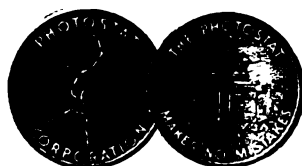
PHILADELPHIA, PA., 510 North American Building
SAN FRANCISCO, CAL., 429 Monadnock Building
WASHINGTON, D. C., 700 Tenth Street, N. W.

EXECUTIVE OFFICE: PROVIDENCE, R. I.

Products

The PHOTOSTAT, a Photographic Copying Machine.
Also Photostat Paper and Photostat Chemicals.

The word "Photostat" is the registered trade-mark of our products in the United States, Canada, Great Britain, and most of the other countries of the world.



FOR QUICK ERRORLESS FACSIMILE COPIES OF
PENCIL DRAWINGS · BLUEPRINTS · MAPS · CHARTS
TRACINGS · CONTRACTS · RECORDS · ADVERTISING LAYOUTS · ETC
AT ORIGINAL · ENLARGED OR REDUCED SIZE

TRADE-MARK

Description

The machine is loaded with a roll of sensitized paper wound on a spool. Each roll of paper is 350 ft. in length so that a large number of prints can be made from a single roll. The subject to be copied is photographed directly upon this paper and no intermediate film or glass plate negative is used. A prism is attached to the front of the lens and this prism reflects the subject through the lens so that the copy reads from left to right as does the original. As fast as the copies are exposed they are cut off, and developed and fixed right in the Photostat itself. This part of the process as well as the focusing is mechanical. The copies are then washed and dried and are ready for use.

The process is a rapid one. No expert knowledge of photography is necessary as all of the operations are mechanical.

Stock Sizes

The Photostat is made in three models, each of them equipped with either a book holder or an engineering copy board.

PHOTOSTAT DATA

Model No.	Largest size of copy, in.	Size of book holder, in.	Size of engineering copy board, in.	Floor space, ft.
1	11½ x 14	21 x 26	23 x 36	4 x 8
2	14 x 18	21 x 26	31 x 40	5 x 10
3	18 x 22	21 x 26	39 x 48	6 x 12

All of these models can be readily adjusted to copy subjects larger than the copy boards if desired.

Space

The Photostat when assembled requires a space of at least 10 by 12 ft.

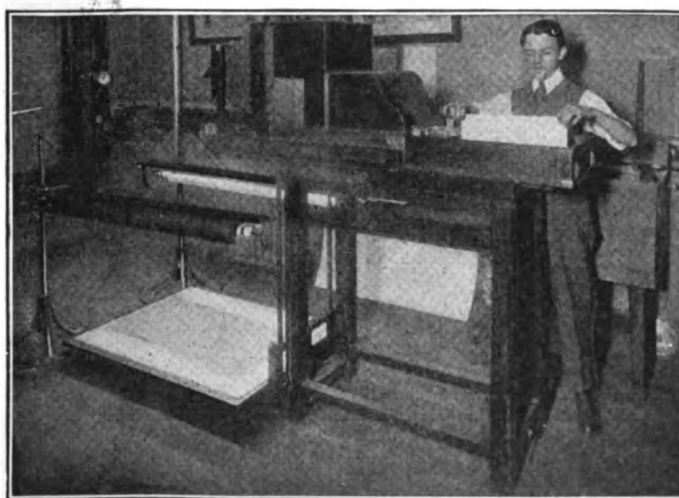
This is not to be construed as the over-all measurements of the apparatus, but for the convenience of the operator in making exposures, adjusting the apparatus, washing and drying the prints, a space the size mentioned is advisable and recommended.

Uses

To make copies at original, enlarged or reduced size of:

Pencil drawings
Ink drawings
Blue prints
Tracings
Sketches
Maps
Letters
Telegrams
Tabulations
Record cards
Reports

Contracts
Documents
Specifications
Data sheets
Pages from books
Insurance records
Shipping lists
Patent drawings
Illustrations for salesmen
Production sheets
Advertising layouts



PHOTOSTAT IN OPERATION

BUFF & BUFF MFG. CO.

Manufacturers of Surveying Instruments

NEW YORK OFFICE
Hudson Terminal, 46 Dey Street

Jamaica Plain Station
BOSTON, MASS.

CHICAGO OFFICE
231 North Wells Street

Products

"BUFF" TRANSITS and LEVELS.

Also manufacturers of Theodolites, Tripods, Levelling Rods, Plumb Bobs, Plummet Lamps, Steel Tapes, Range Poles, Marking Pins and Current Meters.

Repairs to Instruments

"Buff" transits, solidly built to resist blows and falls, have metal generously distributed throughout the construction. At the Jamaica Plain shops, all makes are repaired with economy and despatch. Injured parts of instruments are duplicated from stock in hand. Telegraph orders can be completed in 24 hours.

Specifications 6¼-inch Buff "Precise" Transit No. 1B

Graduation, 6¼-in. diameter, with two opposite double reading verniers to minutes, placed at either 30° or 90° to line of sight. Two rows of opposite inclined figures 0-360. Graduations silvered and covered by pure crystal plate glass.

Telescope, erecting, is balanced and reverses at either end; 12 in. long, 1¼-in. aperture, with power of 26.5 diameter improved eyepiece, unsurpassed large clear field. Center point is provided on top of telescope to permit of accurate centering from above. Adjustment for vertical plane, and line of collimation correct for all distances. Sensitive level bubble, 6 in. long, with clamp and tangent to telescope. Improved lower and upper spring tangent clamps. Shifting center with ¾-in. adjustment. Spirit levels truly ground by special machine, rated and sensitive. Standards are leather finished. Long taper centers with broad flanges and of hardest bell-metal and phosphor bronze. Compass needle is 4½ in. long and of accepted form. Compass graduation is silvered and figured with a single row 0-90 on each side of N. and S. Tripod improved, split-leg with wing-nuts, weight 7½ lbs.

Mahogany instrument box is provided with strap, brass lock and hooks; contains plumb bob, pocket magnifier, sunshade, wrench, screwdriver, adjusting pins, etc.

Engineers' Levels

18-inch Wye Level—Telescope, 18 in.; 1⅜-in. objective; 36 power; protection to object slide; erecting or inverting eyepiece. Telescope and level tube, leather finished. Phosphor bronze contact points in wyes for bell-metal collars; hard bell-metal center in socket of phosphor bronze. Line of collimation correct for all distances. Adjusted to finest possible accuracy with sunshade in position and focused on mean distance. Mahogany case with strap and hooks, sunshade, wrench, screwdriver, adjusting pin, etc.

Weight, 10¾ lbs.; tripod, 7 lbs. Price, \$210.00.

18-inch Dumpy Level—36 power. Price, \$175.00.

References

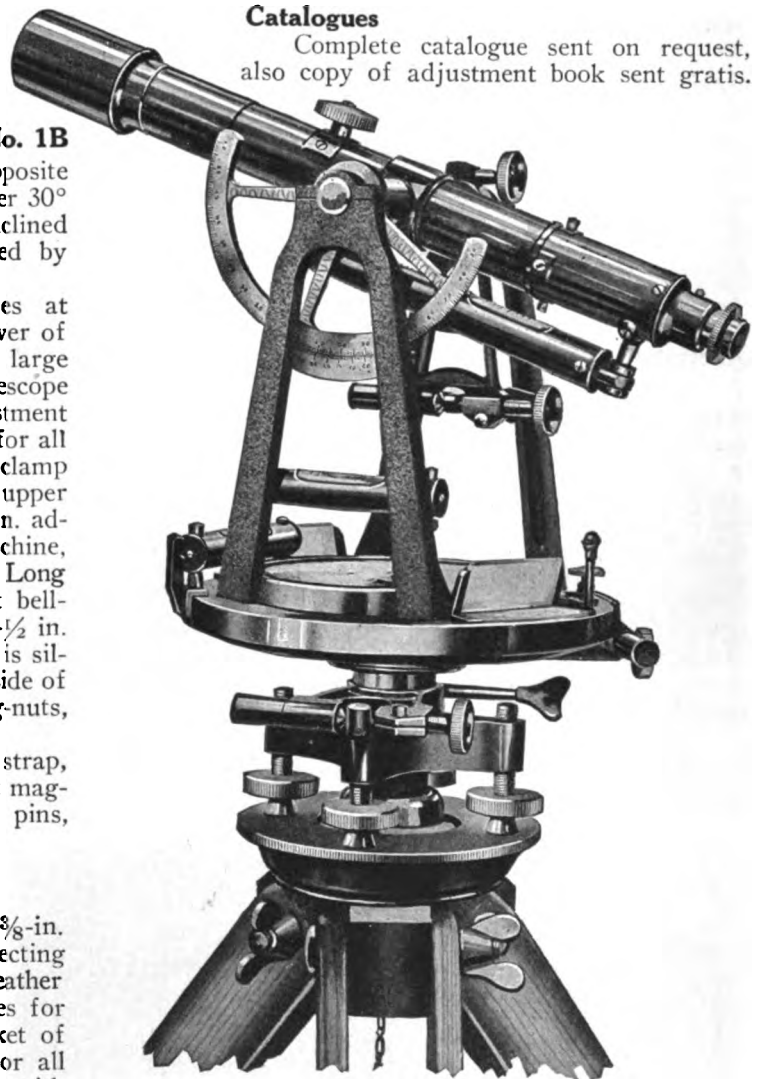
This company are Instrument Makers to the United States Government, many departments; New York Central R. R.; New York, New Haven & Hartford R. R.;

New York Water Board; Public Service Commission and Board of Public Works, New York City; Standard Oil Co.; Guggenheim and Rothschild interests; J. G. White Co., and numberless other engineering organizations. The Pennsylvania R. R. used "Buff" instruments in large numbers in both their North River and East River tunnels. The Subway Commission of New York is now using 450 "Buff" instruments.

Names and addresses of experienced users of "Buff" instruments in the vicinity of any interested inquirer will be furnished on application.

Catalogues

Complete catalogue sent on request, also copy of adjustment book sent gratis.



6¼-INCH BUFF "PRECISE" TRANSIT No. 1B

Patented Nov. 6, 1900; Nov. 13, 1900; Feb. 3, 1903

Price, as shown (silvered graduation).....\$347.00

"PRECISE" TRANSITS

Size.....	No. 1	No. 2	No. 3	No. 4
Weight, lbs.....	13½	10	7	5
Diameter of graduation, in.....	6¼	5¼	4½	4
Length of needle, in.....	4½	3¾	3¼	2½
Power erecting telescope, diam.....	26.5	22.5	18	17
Power inverting telescope, diam.....	29	25	21	20
Length of telescope, in.....	12	10½	8	8
Length level bubble, in.....	6	5½	4	4
Diameter telescope aperture, in.....	1¼	1½	1¼	1¼

HAGGARD & MARCUSSEN COMPANY

Manufacturers of Steel Bunks and Hospital Reclining Chairs

1121 West 37th Street
CHICAGO, ILL.

Products

"TIGER" BOLTLESS STEEL BUNKS.
HOSPITAL RECLINING CHAIRS.

"Tiger" Boltless Steel Bunks

Adaptability—These indestructible bunks meet every requirement for lumber camps, construction camps, etc., and are designed especially for use in bunkhouses and barracks, hospitals, and sanitariums.

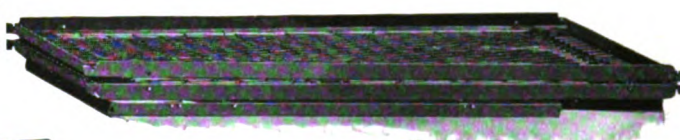
Locking Device—These bunks are equipped with a locking device, which is exclusively used in the "Tiger" bunks, dispensing with bolts or loose parts.

The importance of this feature, enabling the bunk to be set up in two minutes without tools, cannot be

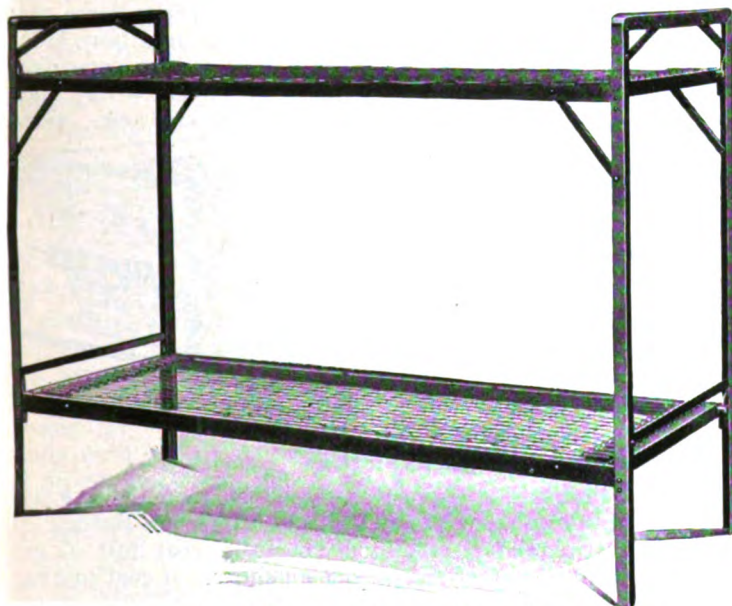


overemphasized. Produces a perfectly tight joint which cannot work loose.

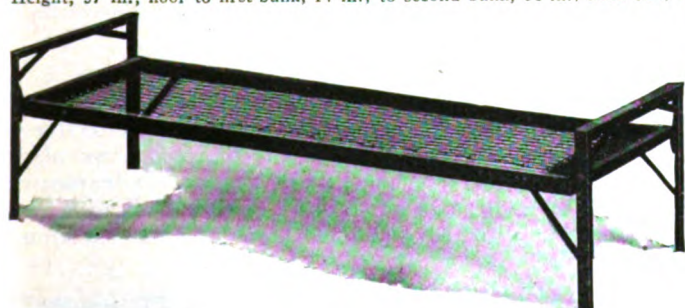
Construction—Frame is "hard angle" steel. Sleeping surface is diamond shaped wire link fabric with high carbon, oil tempered helical springs. The diamond shape of the link distributes tension diagonally and affords elasticity crosswise, dispensing with the need of small helical springs for fastening fabric to side rails, so common when straight link fabrics are used, and which easily become overstretched.



"TIGER" DOUBLE DECK BUNK KNOCKED DOWN FOR SHIPMENT OR STORAGE
Takes up little room and is convenient to handle



"TIGER" BOLTLESS DOUBLE DECK BUNK
Height, 57 in.; floor to first bunk, 14 in.; to second bunk, 36 in.; head rail, 7 in.



"TIGER" BOLTLESS SINGLE DECK BUNK
Height, 20 in.; from floor to bed, 14 in.; head rail, 6 in.

SIZES AND WEIGHTS "TIGER" BOLTLESS STEEL BUNKS

No. 1585 Double Deck	No. 1586 Single Deck
4 ft. 6 in. x 6 ft. 5 in. 142 lbs.	4 ft. 6 in. x 6 ft. 5 in. 75 lbs.
3 ft. 0 in. x 6 ft. 5 in. 93 lbs.	3 ft. 0 in. x 6 ft. 5 in. 49 lbs.
2 ft. 6 in. x 6 ft. 5 in. 85 lbs.	2 ft. 6 in. x 6 ft. 5 in. 45 lbs.

Also furnished in triple deck.

Frames: Side rails and head and foot sections, $1\frac{1}{2} \times 1\frac{1}{2} \times \frac{1}{4}$ in. angle steel. Braces, $\frac{1}{2} \times \frac{1}{2}$ in. Fabric, wire link.

Hospital Reclining Chair

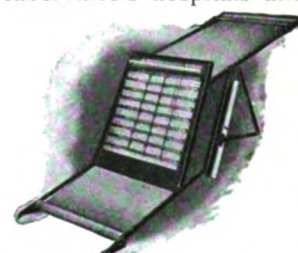
Used extensively by tuberculosis hospitals and sanitariums.

No. 28 has double steel spring seat and adjustable strap support across the back for comfort. A pair of helical springs at the top keeps the khaki cover drawn snugly.

The construction is such that it is opened or closed by simply pressing the head and foot parts together. To set up the chair requires the insertion of only two small bolts, taking but a minute or two.

Framework and standard are of steel, riveted and well braced, and finished in black enamel baked on to stay. The chair folds down flat for crating.

Especially suitable for hospital convalescents and tuberculosis sanitariums. Automatic adjustment makes the chair follow every change of posture without requiring a thought. It works on its own standard, taking up little space.



REINFORCED SPRING SEAT
Patent applied for



HOSPITAL RECLINING CHAIR

ATLAS POWDER CO.

Manufacturers of High Explosives, Blasting Powder and Blasting Supplies
WILMINGTON, DEL.

ALLENTOWN, PA.
HOUGHTON, MICH.
MEMPHIS, TENN.

BIRMINGHAM, ALA.
JOPLIN, MO.
PITTSBURGH, KANS.
DES MOINES, IOWA

McALESTER, OKLA.

BRANCH OFFICES

PITTSBURGH, PA.
BOSTON, MASS.
KANSAS CITY, MO.
PHILADELPHIA, PA.

NEW ORLEANS, LA.
POTTSVILLE, PA.
CHICAGO, ILL.

KNOXVILLE, TENN.
NEW YORK, N. Y.
ST. LOUIS, MO.
WILKES-BARRE, PA.

Products

ATLAS BLASTING SUPPLIES and EXPLOSIVES, which include: Chemicals, Blasting Caps, Electric Blasting Caps, Blasting Batteries, Galvanometers, Rheostats, Leading and Connecting Wire, Thawing Kettles, Carrying Cases for blasting caps, etc.



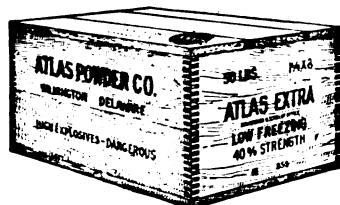
Dynamite

Atlas Nitroglycerine Dynamite, Strengths 20% to 60%—A high explosive similar to the original dynamite. Exceedingly quick in action, it develops a great disruptive and shattering force, and should be used only where such an effect is desired. It is low freezing and may be used in open work in cold weather without thawing, if charges are fired promptly. Recommended for mud-capping rock, blasting ditches in wet ground, breaking old machinery and castings, etc. An Atlas No. 6 blasting cap or electric blasting cap should be used to detonate this explosive.



ATLAS POWDER

Atlas Extra Dynamite, Strengths 15% to 75%—For general blasting in mining, quarrying, railroad construction, road building, Atlas Extra is superior to Atlas nitroglycerine dynamite. Particularly suited to underground work as its fumes are not as objectionable as those given off by nitroglycerine dynamite. It exerts more of a heaving and lifting force, than a rending and shattering one. Atlas Extra is not recommended for very wet work, but it is used to best advantage in comparatively dry operations where the material to be blasted is not unusually hard. It is low freezing and will not require thawing except in very severe weather.



ATLAS EXTRA

Atlas Low Freezing Gelatin Dynamite, Strengths 25% to 90%—Has all the advantages of ordinary gelatin dynamite, such as being waterproof, absence of objectionable fumes, etc.,



ATLAS GELATIN

and, in addition, does not freeze and become insensitive above 10° Fahr. Unequalled for blasting in mines and tunnels where the temperature is low and ventilation poor. Nothing weaker than a No. 6 blasting cap or electric blasting cap will properly explode it.

Atlas Low Powder, Strengths 5% to 20%—This is a low grade, granular high explosive which may be said to rank between blasting powder and dynamite. It is made in four grades: RRP, F, FF, and FFF. RRP is the lowest grade and is usually put up in paraffined paper bags and packed in wood cases. Will run freely into bore holes and crevices. Other grades packed in cartridges like dynamite. Of great value in open work, such as quarries, railroad cuts, mine strippings, etc., when material to be blasted is comparatively soft and no great amount of water is present. Also used in blasting large stumps. Should be detonated with a primer of nitroglycerine dynamite of not less than 40% strength.



ATLAS RRP

Atlas Permissible Explosives

Permissible explosives should be used in all gassy or dusty mines. When used according to Bureau of Mines' regulations they will not ignite coal dust or gas mixture. To meet the various conditions of coal mining, Atlas permissible explosives are made in nine grades under the name of "Coalite." They have all passed the tests demanded by the United States Government Bureau of Mines.

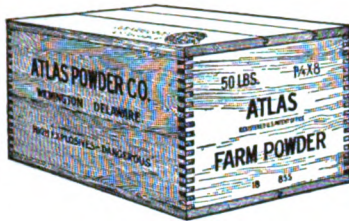
"Coalite"—Nine Grades: A, B, C, D, E, F, G, H and I. All "Coalites" are low freezing, resist water to considerable extent, thus being particularly effective in wet mines, and do not give off dangerous or objectionable fumes. Among these grades are explosives strong or weak, dense or bulky. "Coalites" E, F, H and I are best suited for use in soft, bituminous coal mines; "Coalites" A, C, D, and G are particularly adapted to mining anthracite and the harder bituminous coal; while "Coalite" B ranks between the two groups. All "Coalites" are put up in cartridge form in white paper shells.



COALITE (PERMISSIBLE
EXPLOSIVE)

Atlas Farm Powder

Especially adapted to agricultural blasting. It is a low freezing dynamite of moderate strength, intended for stump blasting, subsoiling, tree planting and ditching. Practically never requires thawing in weather in which it would ordinarily be used. Requires a No. 6 or stronger detonator.



ATLAS FARM POWDER

Atlas Blasting Gelatin

This gelatin is the most powerful explosive of Atlas manufacture. Comparing it with other explosives it may be said to be 100% in strength.

Like gelatin dynamite, it is water resisting and may remain under water for hours without losing its effectiveness.

It is used in bottoms of "cut holes" in tunnels, and in the bottoms of quarry holes where the rock is exceptionally hard, and in submarine blasting.

Atlas blasting gelatin should be used sparingly at first. Use a minimum rather than a maximum charge.

It is so much stronger than all other blasting explosives in common use that an overcharge may do considerable damage.

Blasting gelatin is packed in standard size cartridges and shipped in 50-lb. cases.



ATLAS BLASTING GELATIN

Atlas Blasting Powder

Blasting powder is a slow acting, granular explosive, composed of charcoal, sulphur, sodium nitrate or potassium nitrate (saltpetre).

Two grades are manufactured: "B" blasting powder and "A" blasting powder. "B" blasting powder is usually used in coal mining and for blasting shale, earth and dimension stone. "B" blasting powder is manufactured in 7 granulations: FFFF, the finest, to CCC, the coarsest. The finer granulations are quicker in their action and exert a greater breaking and shattering effect on the material blasted; while the slower granulations have a tendency to lift and heave it out in large lumps. A mixed granulation consisting of FF, FFF and FFFF is used in railroad construction work.

Blasting powder does not freeze, but must be kept dry. It is useless when wet and when damp it loses its efficiency. Damp powder when exploded gives off much more smoke than dry powder. Blasting powder is packed and shipped in sheet steel kegs containing 25 lbs.



BLACK BLASTING POWDER

Atlas Blasting Machines

Generate electric current for firing electric blasting caps. Made in five sizes:

No. 2 for stump and boulder blasting, quarrying and mining where it is not necessary to fire more than 10 charges at any one time.

No. 3 will fire 30 electric blasting caps simultaneously. For quarrying, mining and blasting ditches.

No. 4 for use in quarrying and mining. Capacity, 50 copper wire electric blasting caps.

No. 5 for quarry and contracting work where a large number of charges are to be fired at once. Capacity, 100 copper wire electric blasting caps.

No. 6, extra powerful. Will fire 150 copper wire electric blasting caps.

Complete information about blasting machines sent on request.



BLASTING MACHINE

Davis No. 1 Blaster

A light weight machine especially made for coal mining and other operations where it is not necessary to fire more than one or two charges at a time. It has a capacity of 5 copper wire electric blasting caps and weighs 3 1/4 lbs. It is operated by a removable key or handle which, when kept in the possession of the blaster, prevents the operation of the machine by any other person. This is an important safety feature.



DAVIS NO. 1 BLASTER

Atlas Electric Blasting Caps

Detonators containing electric wires embedded in the explosive charge and connected by a platinum bridge of high resistance. When an electric current is passed through one of these the charge is exploded.

They are made in two strengths, No. 6 and No. 8 and furnished with insulated copper wires of the following lengths: 4, 6, 8, 10, 12, 14, 16 ft. Longer lengths to order. The No. 6 electric blasting cap contains 1 gram of explosive charge and the No. 8 contains 2 grams.

All Atlas electric blasting caps are packed in pasteboard cartons, enclosed in heavy wood cases. Cartons contain either 25 or 50 depending on the length of wires. Waterproof electric blasting caps for submarine blasting are furnished in all lengths.



ELECTRIC BLASTING CAP

Atlas Non-Freezing Explosives

This new explosive is the result of years of experimental work, and is offered to the trade only after its efficiency has been proved both in laboratory and field tests.

Atlas Non-Freezing never requires thawing. No matter how low the temperature may go, Atlas Non-Freezing remains in perfect condition for blasting.

Atlas Non-Freezing explosives will not cause headaches from handling. As they never require thawing, they insure greater safety and save labor.

Write for complete information about Atlas Non-Freezing explosives and how they may be used in your work.

CHICAGO PNEUMATIC TOOL COMPANY

1002 Chicago Pneumatic Building
NEW YORK, N. Y.

For Sales and Service Branches, see page 656.

Products

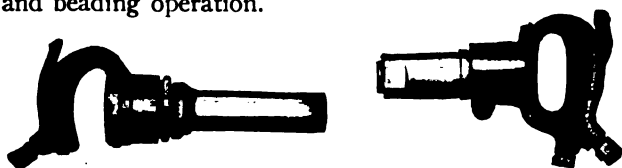
PNEUMATIC TOOLS, including CHIPPING, CALKING AND RIVETING HAMMERS, AIR DRILLS, WOOD BORERS, and "CLOSE QUARTERS" DRILLS, SAND RAMMERS, SELF-ROTATING HAMMER DRILLS, ROCK DRILLS, ELECTRIC DRILLS and GRINDERS.

PNEUMATIC GEARED HOISTS and WINCHES.

For Air Compressors and Semi-Diesel Oil Engines, see pages 656-657.

Boyer and Keller Chipping and Calking Hammers

A complete line for every chipping, calking, scaling and beading operation.



BOYER CHIPPING AND
CALKING HAMMER

KELLER CHIPPING AND
CALKING HAMMER

CHIPPING, CALKING, AND SCALING HAMMERS

Size and style	Piston diam., in.	Length stroke, in.	Service for which suited	Weight, lbs.		Code	
				Net	Shpg.	Round	Hexagon
*†BOYER "BK" CHIPPING AND CALKING HAMMERS							
1	1 1/4	1	Light chipping	12 1/2	13 1/2	Abhume	Abhurl
1 -x	1 1/4	1 1/2	Medium chipping	12 1/2	13 1/2	Abiabie	Abiaction
2	1 1/4	2	General chipping	12 3/4	14	Abiadum	Abiding
3	1 1/4	3	Heavy chipping	14 1/2	15	Abigail	Ability
4	1 1/4	4	Extra heavy chipping	15 1/2	16 1/2	Abiology	Abiolus

*BOYER CHIPPING, CALKING AND SCALING HAMMERS							
F	1 1/4	1 1/4	Scaling hammer	8 1/4	16	Abjection	Abjection
BB	1 1/4	1 1/4	Flue beading	7 1/4	18	Abdomen	Abdominal
B	1 1/4	2	Light chipping	10 1/4	12 1/4	Abdiquer	Abditory

*KELLER CHIPPING, CALKING AND SCALING HAMMERS							
0	1 1/4	1 1/4	Scaling hammer	6 1/4	6	Abed	Abelle
1	1 1/4	1 1/4	Scaling hammer	6 1/4	7 1/2	Abelric	Abelric
1-x	1 1/4	1 1/2	Light chipping	11 1/4	12	Abenaur	Abervdevine
2	1 1/4	2	Medium chipping	11 1/4	12 1/2	Aberrant	Aberrant
3	1 1/4	3	General chipping	12 1/4	12 1/2	Aberrance	Aberrance
4	1 1/4	4	Heavy chipping	13 1/4	14 1/2	Abetting	Abettment
4	1 1/4	4	Extra heavy chipping	15	26	Abeyantly	Abhor

*When ordering specify "round" or "hexagon" bushings. Chisels furnished at extra charge.

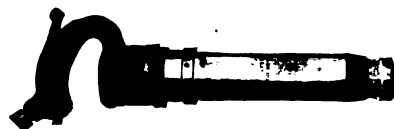
†In ordering, specify whether heavy or light type handle is desired. The heavy type is standard.

‡Valveless.

Boyer Riveting Hammers

The world's standard wherever rivets are driven.

Patented 3-unit construction secures unusual accessibility, ruggedness and giant driving power.



BOYER LONG STROKE
RIVETING HAMMER

BOYER RIVETING HAMMERS

Type	Size No.	Piston diam., in.	Length stroke, in.	Capacity rivets, in.	Blows per min.	Shipping weight, lbs.
H.....	H-3	1 1/4	3	3/4	2100	13
	H-4	1 1/4	4	1 1/4	2000	13 1/2
	50	1 1/4	5	1 1/2	1400	19
	60	1 1/4	6	1 3/4	1150	21
Standard...	80	1 1/4	8	1 3/4	1050	22 1/2
	90	1 1/4	9	1 3/4	900	24
	80-X	1 1/4	8	1 3/4	850	27
	11	1 1/4	11	1 3/4	650	28

May be equipped with safety device for preventing accidental shooting out of piston or rivet set.



TRADE-MARK

Little Giant Air Drills

Balanced piston type. Four single acting cylinders arranged in pairs, each pair of pistons connected to opposite wrists of a double crank shaft. Pistons of each pair travel in opposite directions at all parts of stroke, insuring smooth operation.

All Little Giant drills are of standard design, varying only in size and construction to adapt them to particular uses. Reversible and non-reversible types. Range in drilling from 1/4 to 3 in. in steel.



LITTLE GIANT CLOSE
QUARTERS DRILL

LITTLE GIANT AIR
DRILL

Little Giant Close Quarters Air Drills—Useful for tapping, flue rolling, etc., in close quarters. A compact train of gears provides smooth, uninterrupted rotation of spindle, overcoming the objectionable intermittent action of ratchet levers in the so-called ratchet types.

LITTLE GIANT AIR DRILLS

Size No.	Speed light, r. p. m.	Air used, cu. ft. per min.	Capacity, in.°	Weight net, lbs.
			Drill Ream Tap Flue roll	

LITTLE GIANT AIR DRILLS									
10 F	2200	11	00	1/4	—	—	—	—	8
10 S	1000	7	0	1/4	—	—	—	—	8 1/2
3 S (1)	1800	15	0	1/4	—	—	—	—	11 1/2
3 RS (1)	1200	15	0	1/4	—	—	—	—	14 1/2
3 A (2)	800	15	1	1/4	—	—	—	—	12
4 (2)	800	20	2	1/4	1/2	1/2	—	—	22
4R (2)	360	18	2	1/4	1/2	1/2	1/2	—	24
4T	370	18	2	1/4	1/2	1/2	1/2	—	24
4C (2)	240	20	3	1/4	1/2	1/2	1/2	—	28
4RC (2)	125	18	3	1/4	1/2	1/2	1/2	2	30
4TC	130	18	3	1/4	1/2	1/2	1/2	2	30
2 (2)	480	25	3	1/4	1	1	—	—	40
2R (2)	325	20	3	1/4	1	1	2	42	42
12	325	20	3	1/4	1	1	2	44	44
2C (2)	155	25	4	2	1 1/2	1 1/2	—	52	52
2RC (2)	120	20	4	2	1 1/2	1 1/2	2 1/2	54	54
12C	120	20	4	—	1 1/2	1 1/2	2 1/2	56	56
1 (2)	400	35	4	2	2	2	—	58	58
1R (2)	230	30	4	2	2	2	2 1/2	66	66
11	230	30	4	—	2	2	2 1/2	62	62
15 (2)	260	35	4	2	2 1/2	2 1/2	—	68	68
15R (2)	180	30	4	2	2 1/2	2 1/2	3	76	76
15T	180	30	4	—	2 1/2	2 1/2	3	74	74
1C (2)	110	35	5	3	2 1/2	2 1/2	—	77	77
1RC (2)	65	30	5	3	2 1/2	2 1/2	4	85	85
11C	58	30	5	—	2 1/2	2 1/2	4	81	81
15C (2)	80	35	5	3	3	3	—	85	85
15RC (2)†	52	30	5	3	3	3	4	90	90
15TC	50	30	5	—	3	3	4	88	88

LITTLE GIANT CLOSE QUARTERS DRILLS

81 (3)	310	25	3 1/4	1	—	—	—	24
91 (3)	180	35	4 1/2	1 1/4	—	—	—	40
81R (3)	240	25	3 1/4	1	—	—	—	36
91R (3)	120	35	4 1/2	1 1/4	—	—	—	42
3	400	20	2 1/4	3/8	—	—	—	20

LITTLE GIANT WOOD BORING MACHINES

10S (4)	1000	7	—	1/4	—	—	—	8
3RS (4)	1200	15	—	1	—	—	—	14 1/2
3RSS (4)	600	15	—	1	—	—	—	14 1/2
5 (5)	650	18	—	2 1/2	—	—	—	22
6S (5)	370	18	—	2 1/2	—	—	—	22
14 (5)	700	20	—	4	—	—	—	32
14S (5)	325	20	—	4 1/4	—	—	—	32

*Nos. 00 and 0 indicate chuck sizes; other numbers indicate Morse taper sockets.

†Nos. in parentheses indicate the following regular equipment:

(1) Breast plate and No. 0 chuck.
(2) Feed screw.
(3) Ratchet wrench for feed screw.
(4) Grip handle and wood bit chuck.
(5) Wood bit chuck. ‡Suitable for special extra heavy reaming and tapping.

§Letter "R" indicates reversible type drills; letter "C" indicates compound geared drills; letter "T" indicates drills fitted with grip handles and especially adapted for tapping flue rolling or reaming. *Drilling capacities are for drilling in metal—except wood boring machines, for which capacity in soft dry pine is given.

¶Nos. 10-F to 3-A inclusive, and No. 3 have 1/4-in. hose connections; Nos. 4 to 91-R inclusive have 1/2-in. hose connections. †At 80-lb. pressure.

Little Giant Geared Air HoistsLITTLE GIANT
GEARED AIR HOIST

Great hoisting power; unusually rugged steel construction; economy of air; absolute safety. Simple, valveless air motor operates equally well in either direction and has repeatedly demonstrated its power and air economy advantages. Automatic air brake makes slippage impossible. "Limit" stop device supplies infallible protection against jam-ups from over-hoisting. All gears cut from solid stock, accurately machined and case hardened. Lubrication of the "splash" type. Ask for bulletin.

LITTLE GIANT PORTABLE GEARED AIR HOISTS

Size No.	Capacity, tons	Height of lift, ft.	Lifting speed, ft. per min.	Distance between hooks, in.	Air consumption per ft. lift, cu. ft.	Net weight, lbs.	Code
10	1	9	28	39	3	355	Accrescent
11	2	9	16	39	4	360	Accretion
12	3	11	10	45	8	465	Accroach
13	5	12	7	53 1/2	15	820	Accroire
14	10	12	4	61 1/2	27	1080	Accrue

Note: When desired, Little Giant portable geared hoists can be supplied in any of the above sizes, except size 10, equipped with either a plain trolley, geared single track trolley or a geared double track trolley. When ordering, always state size and weight of channels on which trolley must operate.

Little Giant Electric DrillsLITTLE GIANT
PORTABLE
ELECTRIC DRILL

These well-known wood and metal drills may be operated wherever there are current outlets of the proper electrical characteristics. Provided with improved ventilating system for windings; splendid provision for lubrication; ball bearings, stub-tooth gears; built in a complete line for light and heavy duty, and in direct current and alternating current types; also "Universal" types for operation interchangeably on direct current or alternating current.

LITTLE GIANT ELECTRIC DRILLS—DRILLING CAPACITIES IN METAL

Size No.	*Universal for 110 and 220 volts, in.	D.C. for 120 and 240 volts, in.	**A.C. for 2-phase and 3-phase, in.	D.C. for street railway work, 600 volts, in.
000	3/8			
000x	1/2			
00-B	5/8			
0-B	3/4			
1B	7/8			
1 1/2-B	1			
2B	1 1/8			
3B	1 1/4	1 1/4	1 1/4	1 1/4
4B	1 3/4	2	2	1 3/4

*For connection to ordinary lamp socket. D. C. or A. C. of 60 cycles or less, single-phase interchangeably.

**Standard windings are for 60 cycles, 120 or 240 volts. Nos. 2, 3 and 4 can be wound for 380 or 440 volts.

Note: In ordering specify Size No.; also whether D. C., A. C. or "Universal" type is desired. (If A. C., specify cycles and phase.)

Little Giant Electric Hammer DrillsLITTLE GIANT
ELECTRIC
HAMMER DRILL

For drilling concrete and soft stone, for light chipping of metals or wherever an electrically operated percussive drill is necessary for effective work. Ask for Bulletin E-62.

LITTLE GIANT ELECTRIC HAMMER DRILLS

Maximum capacity in soft stone or concrete	1 in.
Weight, net	21 lbs.
Length over all	17 1/2 in.

Wound for 110 or 220 volts (Universal type to operate on either D. C. or single-phase A. C.).

Little Giant Portable Electric Grinders

Similar in construction to Little Giant electric drills. Widely used in foundries, machinshops, structural shops, and for grinding rails on street railways.

The line of Little Giant electric grinders also includes: precision, toolpost and surface types. Bulletin on request.

LITTLE GIANT PORTABLE
ELECTRIC GRINDER**LITTLE GIANT PORTABLE ELECTRIC GRINDERS**

Size No.	R. p. m.		Size wheel, in.	Weight, lbs.
	120-240-600 volts D. C.	120-240-440 volts A. C. 2- and 3-phase, 60 cycles		
5-BP	4000	3600	5x 3/4 x 1/2	15
8-BP	2400	1800	6x 1 1/4 x 3/4	28

Hummer Self-rotating Hammer Drill

For general use in the industrial, contracting, mining and quarrying fields for a wide variety of purposes, displacing to a large extent the heavier, more cumbersome and expensive, mounted rock drills.

Simplicity, sturdiness in construction, ease of operation, independent motor rotation, low cost of upkeep, fast drilling and hard hitting power are the leading features. Furnished for wet or dry work.

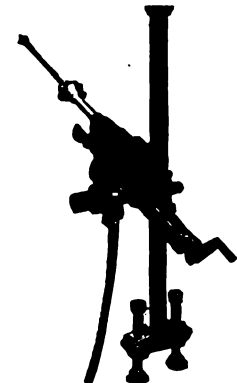
GENERAL SPECIFICATIONS HUMMER DRILL WITH INDEPENDENT MECHANICAL ROTATION

Designating symbol	A-86
Diameter cylinder, in.	2 1/4
Length stroke, in.	3 1/4
Weight, lbs.	45
Length over all, in.	18 3/4
Size hose to use, in.	3/4
Size steel (hollow hexagon), in.	3/4
Code word	Rezaba

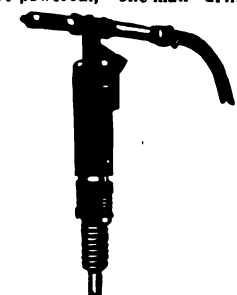
A-86 HUMMER
SELF-ROTATING
HAMMER DRILL**Chicago Gatling and Slogger Rock Drills**

Gatling Drill—A one-man drill; weighs 145 lbs. and easily drills up to 8 ft. It strikes a very rapid blow—800 per minute on the long stroke—which accounts for its quick drilling capacity. Write for Bulletin 505.

Slogger Drill—Strikes a hard, rapid blow. Made in 4 sizes. Distinctive features are improved valve motion, adjustable shell, positive lubrication, release rotation, bushed front head with taper sleeve and chuck for taking unshanked steels.

C-22 IMPROVED TYPE
GATLING DRILL
With patented cushion device, mounted on column. A powerful, "one-man" drill**Demolition Hammer Drill, Type BQ-46**

Useful in industrial plants and construction work for demolition purposes such as tearing out concrete, removing slag from ladles and slag pockets, glass from furnaces, etc. Uses either shanked or unshanked 1-in. hexagon steel, with peg-point or standard bits.

BQ-46 HAMMER
DRILL FOR
DEMOLITION WORK

SULLIVAN MACHINERY COMPANY

Manufacturers of Rock Drills and Air Compressors

ESTABLISHED 1850

86 East Adams Street
CHICAGO, ILL.

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TURIN

WARSAW
TOKYO

SHANGHAI
CALCUTTA

WORKS: CLAREMONT, N. H., CHICAGO, ILL.

Products and Services

ROCK DRILLS and HAMMER DRILLS of many types for use in mines, quarries and on engineering construction; AIR COMPRESSORS; "AIR LIFT" WELL PUMPS; DIAMOND CORE DRILLS for mineral prospecting and test borings; "TURBINAIR" PORTABLE HOISTS.

Also manufacturers of Drill Bit Sharpening Machines; Coal Mining Machines; Forge Hammers; Drill Steel Furnaces; Stone Channeling Machines; Quarrying Machinery; Dry Vacuum Pumps; Gasoline Extraction Compressors.

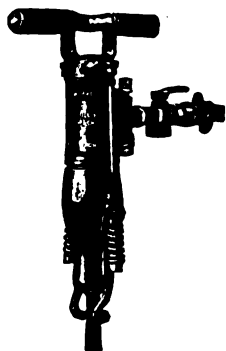
CONTRACTORS for ENGINEERS' TEST BORINGS with Sullivan Diamond Drills, and for MINERAL LAND PROSPECTING.

Rock Drills and Hammer Drills

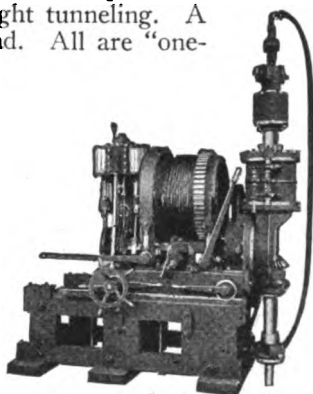
Sullivan rock drills are available in numerous types for any demand of rock removal. Types include:

Rotator Hammer Drills, Bulletin 1670-W. "DX-61" Water Jet Drifters, Bulletin 1670-S. "Dry" and "Wet" Simple and Self Rotating Air Feed Stopers, Bulletin 1670-M. "Plug" and "Foot-Hole" Granite Tools, Bulletin 1670-K. Hyspeed and Liteweight Reciprocating Rock Drills, Bulletin 1670-Q. Submarine Rock Drills, Bulletin 1670-E. Pick Hammers, Bulletin 1670-V.

Rotators—7 types; 29 to 38 lbs. The hollow piston and air tube rotators are particularly adapted for shaft or open cut drilling, having a capacity of 12- to 15-ft. holes. (They have drilled to 36 ft.) Water tube and "cradle mounting" rotators are rapid mine drifters and adaptable for light tunneling. A steam rotator can also be had. All are "one-man" drills, powerful and rapid.



SULLIVAN ROTATOR
HAMMER DRILL



SULLIVAN DIAMOND CORE
DRILLS

Have stood for accuracy in mineral prospecting and engineers' test borings since 1875. Built and stocked in a dozen styles, for capacities to 7000 ft. Standard core fittings, $\frac{1}{2}$ to 2 in. diameter. Hand, gas engine, steam or air power. Will drill holes and take cores at any angle. Improved hydraulic or screw (friction) feed, and remodeled hoisting gear. Oil rigs now available. Bulletin 1669

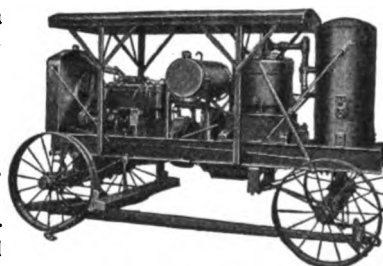
Types of Sullivan Compressors

"WA-6," Simple Steam—Simple air cylinders, straight line; capacities 100 to 400 ft. Bulletin 1677-C.

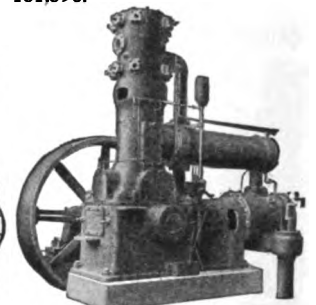
"WJ-3," "WN-3," Angle Compound—Belt or direct motor drive; capacities 400 to 1300 ft. Bulletin 1677-B.

"WJ-4," "WN-4," Twin Angle Compound—For direct synchronous motor drive or belt pulley; capacities 900 to 2800 ft. Bulletin 1677-B.

"WD," "WD-4," Single and Twin Steam Driven Angle Compound Units—With 4-valve high duty steam cylinder; capacities, 1000 to 3500 ft. Form 161,390.



SULLIVAN "WK-31" GASOLINE
ENGINE DRIVEN COMPRESSOR



SULLIVAN "WJ-3" ANGLE
COMPOUND COMPRESSOR

"WG-6," Belted, Single-stage, and "WH-6," Two-stage—Enclosed frame; capacities 50 to 350 ft. Bulletin 1675-R.

"WK-26," Direct Motor Driven—Portable mine car type, single-stage; capacities 100 to 250 ft. Bulletin 1677-A.

"WK-31," Direct Gas Engine Driven—Portable horse truck type, single-stage, for road work, etc.; capacity 150 ft. Bulletin 1675-T. Also "WK-32," motor driven and "WK-34," tractor driven, portable units.



SULLIVAN AIR LIFT PUMP WITH
UMBRELLA SEPARATOR

Secures more, purer, cooler water from wells, than other methods of pumping. Simplicity, reliability, sustained efficiency and central control are important features. Acids and chemical solutions handled efficiently on low submergences. Pneumatic displacement pumps and oil well multi-stage systems also available. Bulletin 1671-G



SULLIVAN "TURBINAIR" HOIST

Weights 285 lbs., has a capacity of 500 ft. $\frac{1}{2}$ -in. rope, and lifts 2000 lbs. vertically on 75 lbs. air; $6\frac{1}{4}$ h.p. The "Turbinair" motor is quiet and efficient, providing high torque in starting. Control is by friction clutch and hand brake. Bulletin 1676-A

OHIO LOCOMOTIVE CRANE CO.

Iron Street
BUCYRUS, OHIO

Product

OHIO LOCOMOTIVE CRANES.

Superiority of Our Plant and Product

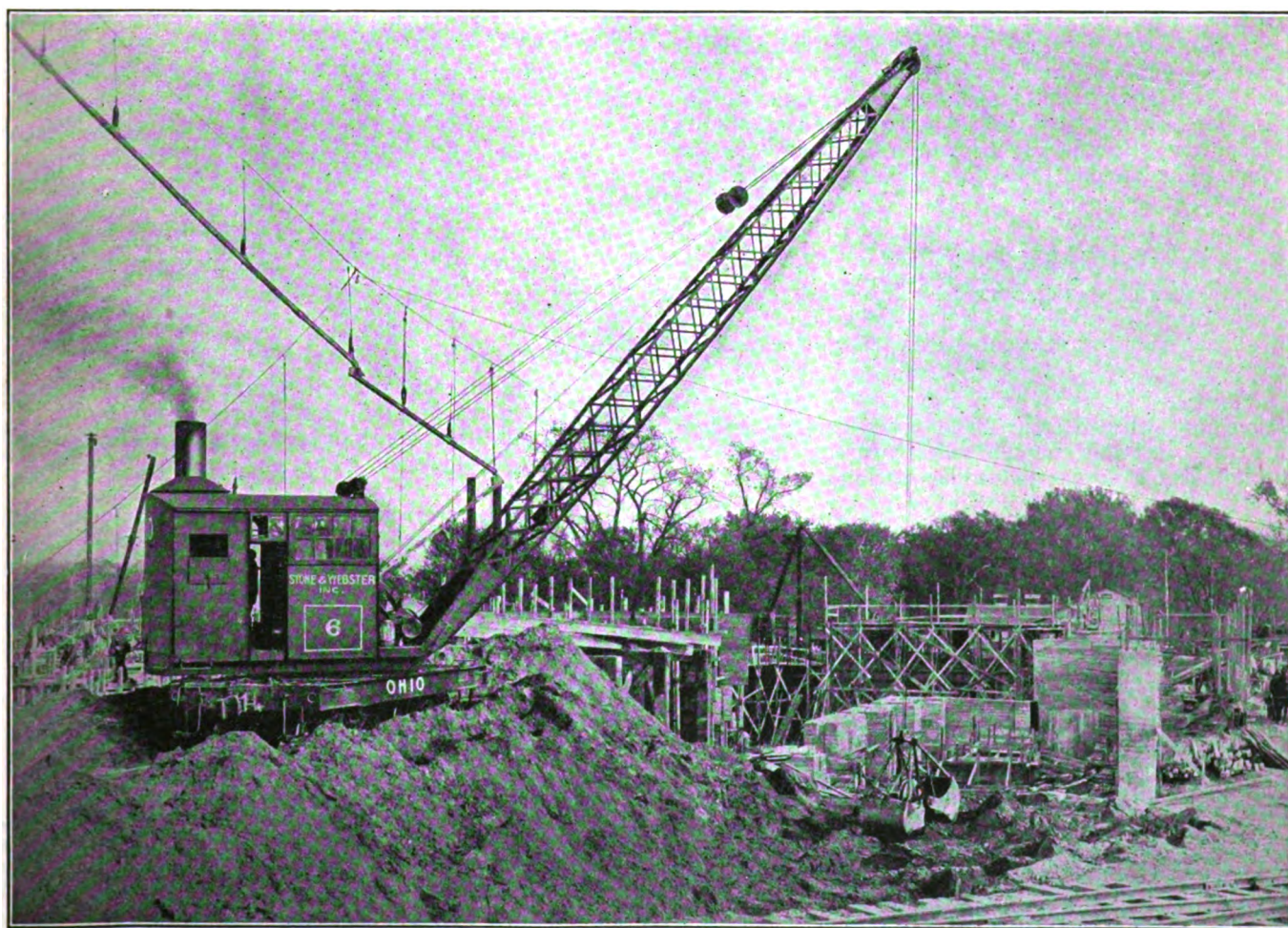
The OHIO LOCOMOTIVE CRANE CO. is the only concern in the country today devoting its time and attention exclusively to the manufacture of locomotive

They can be equipped as follows:

With a bucket for handling sand, gravel, crushed stone, slag, coal, sugar beets, ore, dirt, etc.

With a generating set and lifting magnet for handling scrap iron, castings, bars, etc.

With a dragline bucket or steam shovel attachment for rapid excavation.



TWENTY-TON, EIGHT-WHEEL MODEL "C-D" OHIO LOCOMOTIVE CRANE WITH $1\frac{1}{2}$ CU. YD. HAYWARD CLAMSHELL BUCKET
Used by Stone & Webster Co. of Boston on contract for Hartford Electric Light Co., Hartford, Conn.

cranes. Ohio Locomotive Cranes are built complete in our own plant. Consequently, every manufacturing operation is under our direct supervision, resulting in a finished product of superior type.

Adaptability of Ohio Cranes

Ohio Cranes can be operated by steam, electricity, compressed air or oil engines and can be furnished in capacities ranging from 10 to 50 tons.

With a fall block and hook for all general hoisting purposes.

With pile driving attachments for driving pile and can be used as a switching engine.

Catalogues

Catalogues describing Ohio Locomotive Cranes furnished on request.

THE BYERS MACHINE CO.

Manufacturers of Cranes, Hoisting Machinery and Portable Derricks

207 Sycamore Street
RAVENNA, OHIO

NEW YORK, N. Y.

CHICAGO, ILL.

PITTSBURGH, PA.

Sales and Service Offices in all other Principal Cities, Coast to Coast

Products

MODEL "10" FULL CIRCLE CRANE (10-ton capacity); MODEL "4" AUTO-CRANE (new type); MODEL "1" AUTO-CRANE.

Also manufacturers of Buckets: Clamshell, Excavating, Grab; Portable Derricks; Excavators: Derrick, Grab Bucket, Drainage, Trench; Hoists: Steam, Gasoline, Electric and Belt; Ash and Refuse Handling Machinery; Backfillers; Ditching Machines; Car and Wagon Loaders and Unloaders; Pile Drivers and Steam Shovels.

Byers Cranes—Their Field

Industrial Plant Service—Unloading coal from cars, storing, rehandling; disposing of ashes, etc.; handling scrap with magnet; doing excavating, steel erecting, etc.

General Contracting Service—Unloading and rehandling crushed stone, sand, gravel and other loose materials; serving concrete mixer; passing mixed concrete in batch boxes; unloading machinery, etc.

Owner's Choice of Mounting, Power and Attachments

At purchaser's option, any Byers crane can be furnished for steam, gasoline (or kerosene) or electricity.

Type of mounting is optional also—Cranes furnished on full length or half length crawling traction trucks or "caterpillars" having special all-steel tread with 16½-in. face; or on broad-tire road wheels; or on rail trucks, any gauge.

Either type of crane will operate clamshell, dragline or orange peel bucket, hook, skip, magnet or other special attachments. Boom of any standard length depending on service required.

Byers Full Circle Crane, Model "10"

See detail view showing cab arrangement on next page.

By actual weight, Byers full circle cranes are more than 90% cast and rolled steel and bronze.

Steel Truck Frame—Heavily reinforced and plated top and bottom to prevent warping and twisting when traveling on rough ground; roller path and sluing gear of cast steel, cast in one piece.

Machinery Platform—A solid steel casting weighing 2 tons, carrying engines, shafting, A-frame, lever connections, etc.; boom gears cast integral.

Two Live Power Drums—For clamshell, orange peel or dragline bucket.

Self-locking Worm Boom Hoist—Driven by twin friction clutches; permits raising or lowering the boom under full load while hoisting, rotating or swinging, without stopping or interrupting crane operations. *The "Byers" is the only road crane offering this feature.*

Banked Levers—Within operator's easy reach; well removed from heat of boiler.

Power Plant—Steam operated cranes have 42-in. boiler, 7x7-in. hoisting engines, Byers' own make. Electric cranes furnished with 52 h.p. crane type motor, Morse silent chain drive. Gasoline cranes have 60-h.p., 4-cylinder motor, Morse silent chain drive.

Steering—By power by one man from cab; no ground man needed to steer.

Byers Auto-Crane, Model "4"

This is our standard Auto-Crane; probably the most widely used machine of its type ever brought out.

Recent improvements have been made, greatly increasing its efficiency. The new machine, Model "4," is shown opposite.

Following are some special features that customers will appreciate in this new type Auto-Crane:

Banked levers, operated within operator's convenient reach; elevated platform for operator, giving clear view ahead; 42-in. boiler; semienclosed cab; 120 gal. water tank and steel coal bin. Three-point suspension truck; heavy steel frame; all-steel boom; geared swinger; 16-in. diameter interchangeable sheaves. Firing is done from machinery deck.

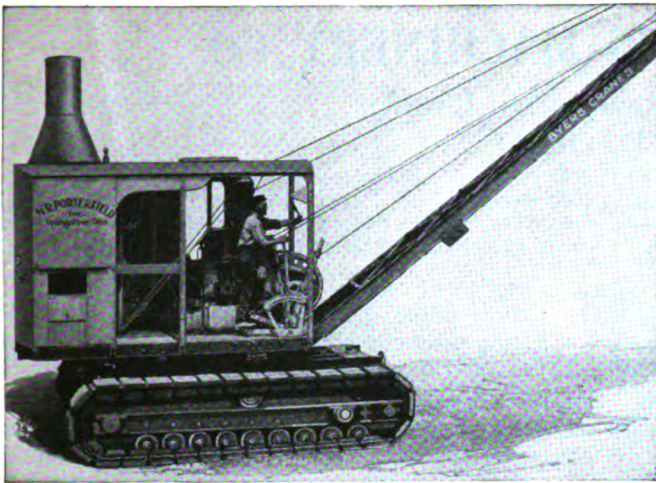
Shipping

"Auto-Cranes" are shipped set up, ready to work, only boom and trucks removed. Full revolving cranes shipped completely set up with only boom removed. Both can be moved from job to job by rail, or will travel over streets. Their size comes within road and highway clearances.

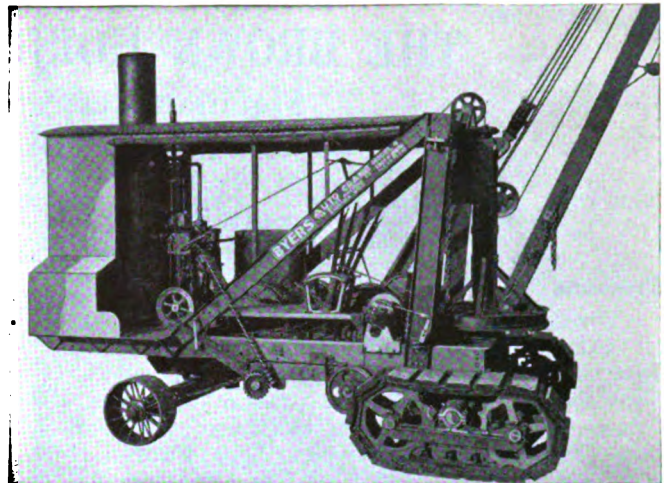
References, Catalogues and Bulletins

We have been building cranes, hoists and similar equipment for over 40 years. More than 850 Byers cranes have been sold. We gladly refer inquirers to nearby installations where machines may be inspected while at work. Catalogues and bulletins, showing application of Byers cranes to various industries, will be sent promptly on request.

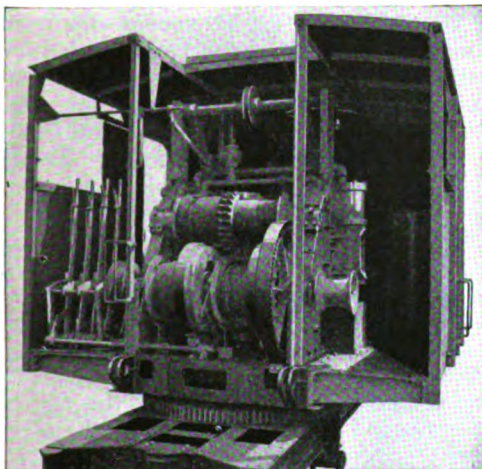
In writing, please furnish us with all possible data showing kinds of work to be done; working location of crane, etc.



BYERS FULL CIRCLE CRANE, MODEL "10"



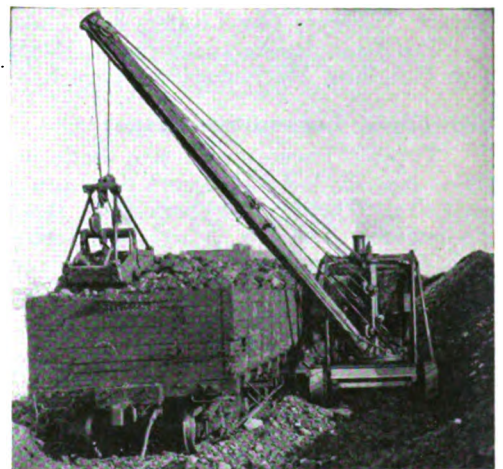
BYERS "AUTO-CRANE," MODEL "4," NEW



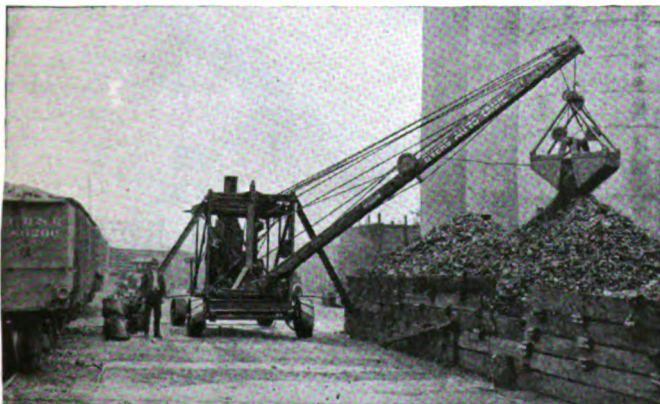
CAB LAYOUT FOR BYERS MODEL "10" CRANE
Note strength, rigidity, accessibility



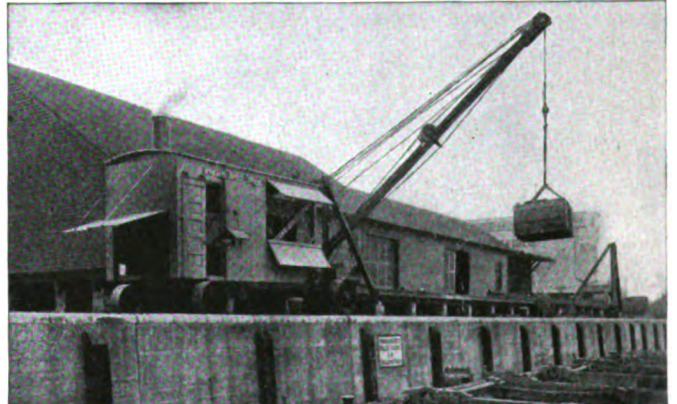
BYERS MODEL "10" IN GENERAL
YARD SERVICE



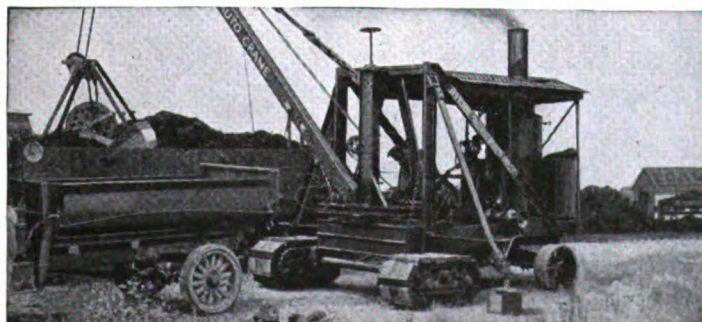
BYERS "AUTO-CRANE" UNLOADING COAL
Operates well in close clearance



IDEAL LAYOUT UTILIZING BYERS "AUTO-CRANE" FOR UNLOADING,
STOCKING AND REHANDLING COAL



STANDARD BYERS "AUTO-CRANE" IN DOCK SERVICE, NEW YORK
BARGE CANAL



MODEL "1" BYERS "AUTO-CRANE" UNLOADING COAL AT SIDING
Invaluable equipment where light crane service is desired

FOUNDED 1880

THE BROWN HOISTING MACHINERY CO.

Manufacturers of Locomotive Cranes
CLEVELAND, OHIO

BRANCH OFFICES

NEW YORK, N. Y., 50 Church Street

CHICAGO, ILL., 208 South La Salle Street

PITTSBURGH, PA., Oliver Building

NEW ORLEANS, LA., Whitney-Central Building

SAN FRANCISCO, CAL., Monadnock Building

EUROPEAN REPRESENTATIVE, H. E. HAYES, 12 Rue de Phalsbourg, PARIS, FRANCE

Products

BROWNHOIST LOCOMOTIVE CRANES.

Also manufacturers of Bridge Tramways; Fast Plants; Cantilever Cranes, Overhead Traveling Cranes, Work Car Cranes, Jib Cranes, Pillar Cranes, Bridge Cranes; Electric Hoists; Tramrail Systems; Trolleys; Crabs; Winches; Tubs; Furnace Hoists; Pig Iron Breakers, and Coal and Ore Dumping Machines; Transfer Cars; Floating, Gantry and Portal Cranes; Dragline Excavators; Monorail Hoists; Grab Bucket Trolleys; Car Loaders and Unloaders.

For Grab Buckets, see pages 34-35; for Coal and Ash Handling Machinery, see page 838.

Brownhoist Locomotive Cranes

Types—These cranes are made in the following sizes: Nos. 2, 3, 4 and 6, and there are several types of each size. They can be operated by steam, electricity or gas engine. The No. 2 and No. 3 sizes are equipped with 4 wheels and the larger sizes are mounted on two M. C. B. standard 4-wheel trucks. The No. 2 crane is also mounted on traction wheels or creeper trucks. Various lengths of booms can be used on the various types.

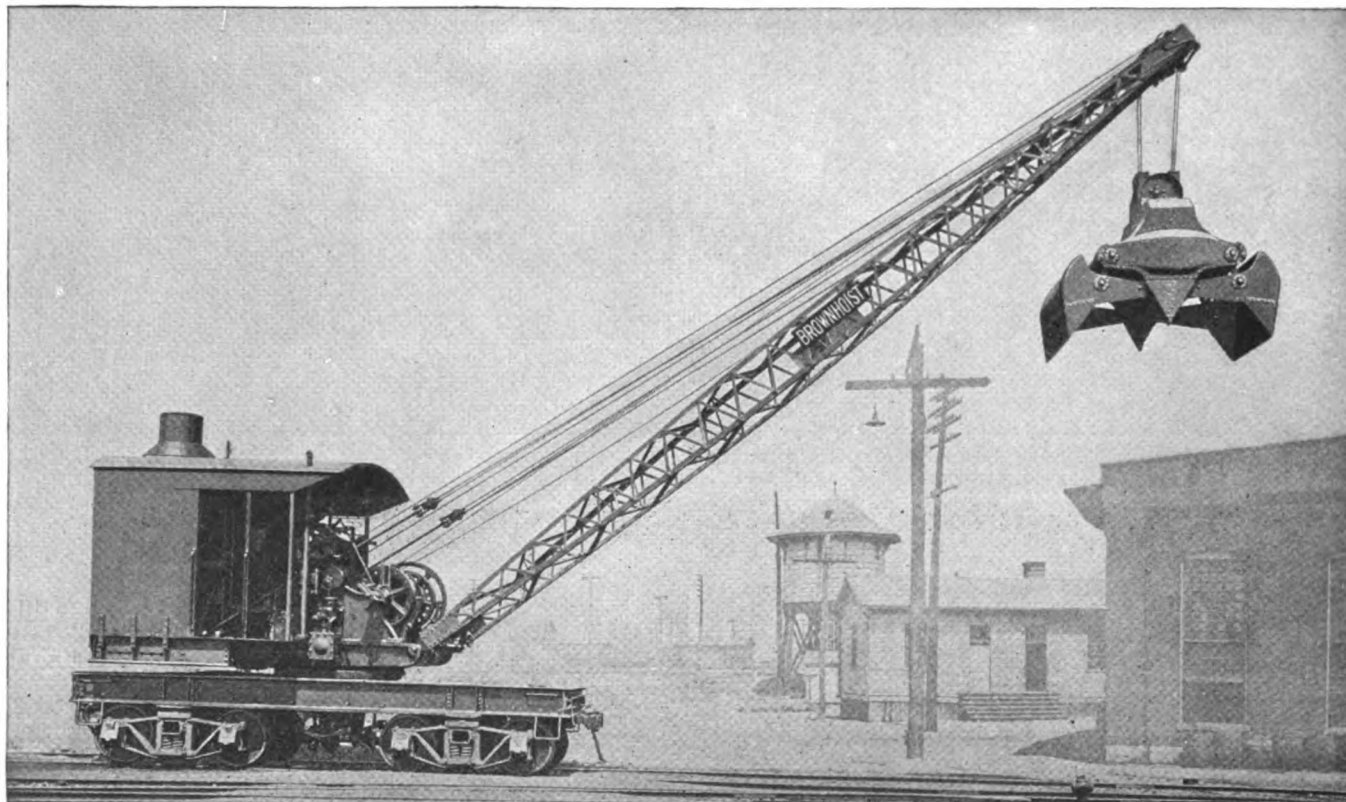
Uses—The cranes can be used for practically all kinds of hoisting work and for handling materials. Some of the uses are: Handling coal, ore, coke, cinders, gravel, crushed stone, etc., with grab bucket; excavating with

BROWNHOIST
TRADE-MARK

dragline or orange peel buckets; driving piles; pulling piling; handling metallic materials with lifting magnet; with bottom block for handling tubs and miscellaneous loads; switching cars.

Speeds—The cranes are equipped with a pair of high speed engines of large diameter and short stroke. Locomotive crane service requires almost constant starting and stopping of the engines, and the engines on Brownhoist cranes develop full power much quicker than the small diameter engines with longer stroke. Under working conditions the engine speeds run from 100 to 700 r.p.m. On a No. 4 steam crane with fully loaded bucket, the hoisting speed is approximately 200 f.p.m. Hoisting or lowering empty hook on one part line on this crane is about 500 f.p.m. Maximum rotating speed with full load is about 3 to 4 r.p.m. Travel speed with full load on straight level track is approximately 600 f.p.m. Speeds under various conditions will be given on request.

Capacities—Capacities vary for the different types, and in the table on opposite page are given capacities at various radii for one type of crane of each size. Larger and smaller capacities are obtained with different type cranes and different length booms. The cranes can be overloaded anywhere from 15% to 60% of the figures given before the crane will tip. With outriggers the overload is a still greater percentage of the rated capacity given.



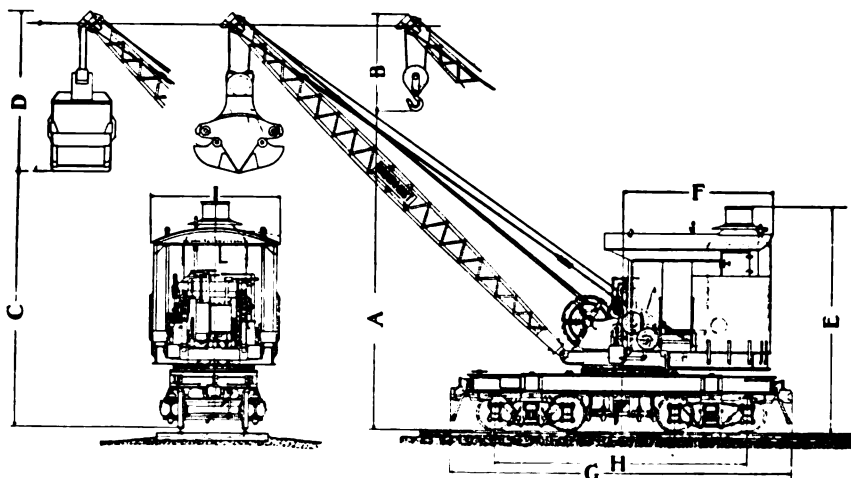
BROWNHOIST STANDARD No. 4 STEAM LOCOMOTIVE CRANE WITH BROWNHOIST 54-CU. FT. LINK-TYPE COAL GRAB BUCKET
No. 4 and No. 6 cranes are mounted on two M.C.B. standard 4-wheel trucks

CLEARANCE TABLE, BROWNHOIST
CRANES

With same lengths of boom as given in table on this page—booms at 45° angle.

	No. 2	No. 3	No. 4J	No. 4A	No. 6
A	22'- 0"	24'	29'	29'	31'
B	6'- 0"	7'	7'	7'	9'
C	20'- 0"	22'	27'	27'	29'
D	8'- 0"	9'	9'	9'	11'
E	15'- 2"	16'	17'- 2"	17'- 2"	17'- 3"
F	10'- 6"	9'-10"	9'-10"	9'-10"	12'- 6"
G	10'- 1"	12'	26'	26'	28'
H	7'- 0"	8'	19'- 2"	19'	20'
I	8'-10"	10'	8'- 8"	8'- 8"	10'

For bucket dimensions, see page 105.

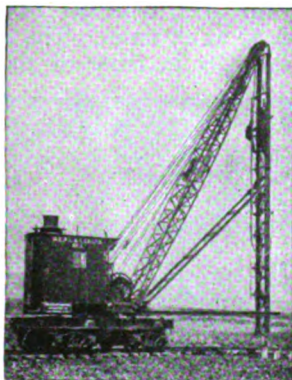


CLEARANCE DIAGRAM OF BROWNHOIST CRANES

Traveling Mechanism—The 4-wheel cranes are supplied with a traveling shaft connected to both axles. On 8-wheel cranes the traveling shaft is connected to one axle on each truck. This shaft is jointed with four universal couplings which insure a good mesh of the gears when the crane is traveling on a curve. The cranes will operate on 60° curves, and also up grades.

Boilers—The steam cranes are supplied with vertical tube boilers having quick steaming qualities. Each boiler is made to comply with the strictest state boiler laws. The size depends upon the size of crane. Boilers are supplied for coal, coke, wood or oil firing.

Operation—All cranes may be operated and fired by one man. A platform is provided for the operator where he can easily reach all levers and brakes necessary for operation. The platform is elevated so that the operator can have a full view of the work at all times.

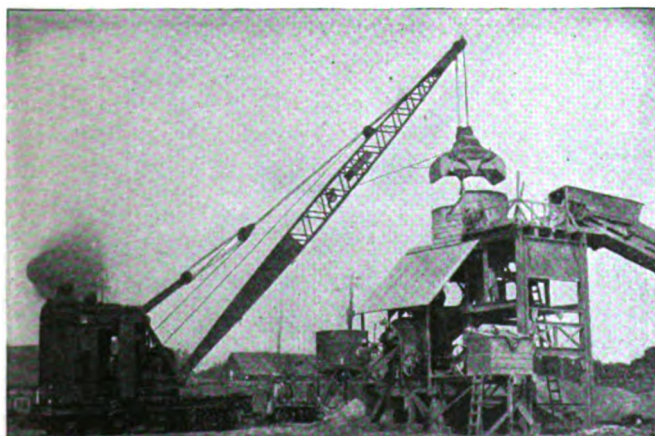
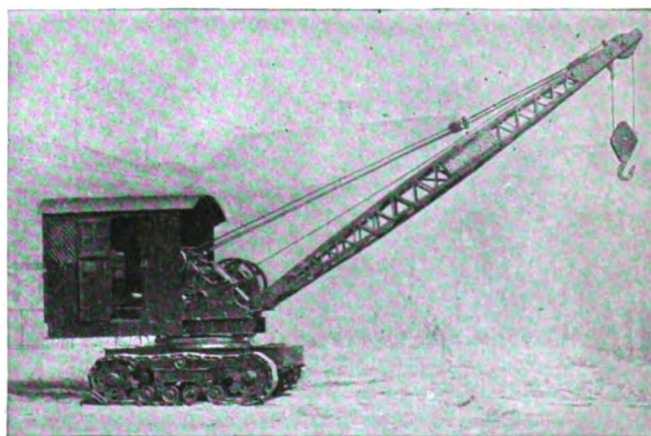
No. 4 CRANE EQUIPPED WITH
LEADS AND STEAM HAM-
MER FOR DRIVING PILESCAPACITIES, WEIGHTS AND WHEEL LOADS, BROWNHOIST
CRANES

Crane	Radius, ft.	Capacities, lbs.		Total weight of crane, lbs.		Max. wheel loads, boom at right angle to tracks, lbs.	
		With- out out- riggers	With out- riggers	With block and full load	With bucket and full load	With block and full load	With bucket and full load
No. 2 Type B 25-ft. boom	15	11100	55100	57600	30000*	17000*
	20	7600	.....			
	25	5700	.....			
No. 3 Type G 35-ft. boom	12	28000	122000	101500	58000*	43500*
	20	16300	.....			
	30	9600	.....			
	39	6700	.....			
No. 4 Type J 40-ft. boom	13	39300	40000	160500	136500	38000	32500
	20	23000	27300				
	30	13800	17300				
	40	9500	12300				
	44	8300	8800				
No. 4 Type A 40-ft. boom	13	42000	44600	170500	138500	40500	33000
	20	24400	27800				
	30	14400	17300				
	40	9700	12100				
	44	8000	8000				
	44	8000	8000				
No. 6 45-ft. boom	12	60000	90000	231000	181000	50000	40000
	15	46000	77000				
	20	32000	56000				
	30	18000	36000				
	40	12000	25000				
	49	10000	19000				

*Max. wheel loads with boom over one wheel and all wheels supported:
No. 2—29000 lbs. with block—20000 lbs. with bucket.
No. 3—66000 lbs. with block—55000 lbs. with bucket.

Prices

Prices will be given on the type of crane necessary to fulfil required conditions.

BROWNHOIST No. 6 STEAM LOCOMOTIVE CRANE FEEDING
MATERIAL TO CENTRAL MIXING PLANTBROWNHOIST No. 2 GASOLINE ENGINE CRANE ON CREEPER
TRUCKS, EQUIPPED WITH HOOK AND BLOCK
No. 2 crane is also mounted on 4 wheels or may be equipped with traction wheels

THE BROWNING COMPANY

Builders of Locomotive Cranes and Buckets

CLEVELAND, OHIO

NEW YORK, N. Y.
SAN FRANCISCO, CAL.
LOS ANGELES, CAL.

SALES OFFICES
PORTLAND, ORE.
CHICAGO, ILL.
SEATTLE, WASH.
WASHINGTON, D. C.

SALT LAKE CITY, UTAH
BIRMINGHAM, ALA.
MONTREAL, CAN.

Products

Manufacturers of LOCOMOTIVE and PORTAL CRANES and their ACCESSORIES, such as Buckets, Pile Driver Leads and Steam Shovel Attachments.

Browning Crane

The Browning locomotive crane is made in various sizes and with either 4 or 8 wheels. It is self-propelling, carries any length of boom and revolves in a full circle.

Independent Rotating Engine—The Browning crane is equipped with an independent swinging engine, eliminating the double rotating clutches. This arrangement increases the speed and ease of operation, and permits of variable speeds in rotating, without in any way changing the speed of the hoist or travel when crane is rotating, hoisting, and traveling at the same time.

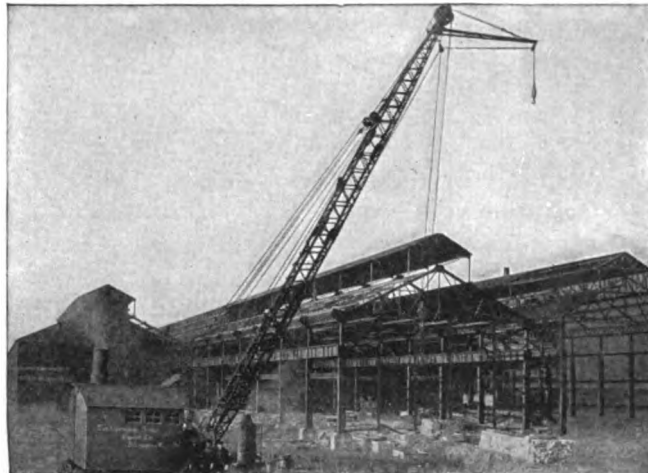
Engines—The engines are vertical slide valve type, reversible by means of Stevenson links. The cylinders and crosshead guide are cast and bored in one piece, which insures absolute alignment.

Clutches—All clutches except the hoist clutch are the positive, or jaw-clutch type. The hoist clutch is the Browning patent all-steel type. This clutch consists of 5 parts, the grip being accomplished by expanding a square helical spring against the inner side of a clutch ring. All parts are case hardened. Outside band friction clutches can be furnished if desired.

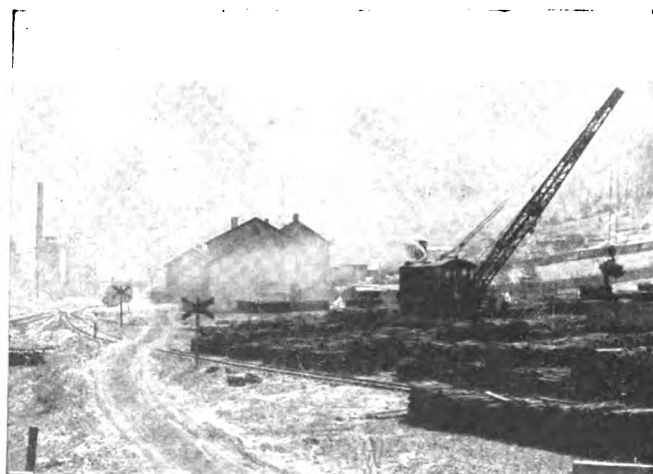
Operation—The operator stands on a raised platform so that he has an unobstructed view of the work ahead at all times. The levers and controls are arranged vertically in front of the operator.



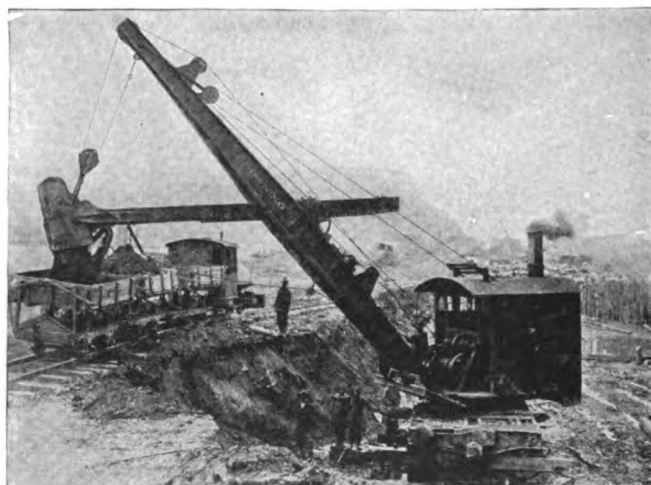
FORD MOTOR CO. CRANES EQUIPPED WITH CLAMSHELL BUCKETS



LAWRENCE STEEL CONSTRUCTION CO. CRANE EQUIPPED WITH SPECIAL BOOM EXTENSION FOR ERECTION WORK



LOCOMOTIVE CRANE EQUIPPED WITH GENERATOR AND MAGNET



BROWNING LOCOMOTIVE CRANE WITH STEAM SHOVEL ATTACHMENT DOING THE WORK OF A STEAM SHOVEL

Browning Buckets

Browning buckets are especially designed by engineers of combined crane and bucket experience for the

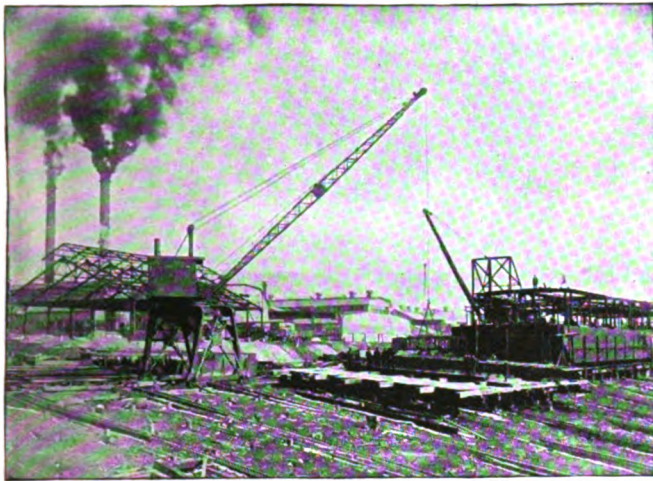
particular line of work they are to perform, and insure satisfactory performance under the most difficult working conditions. All wearing parts are bronze bushed and carry individual grease cups.

Co-operative Service

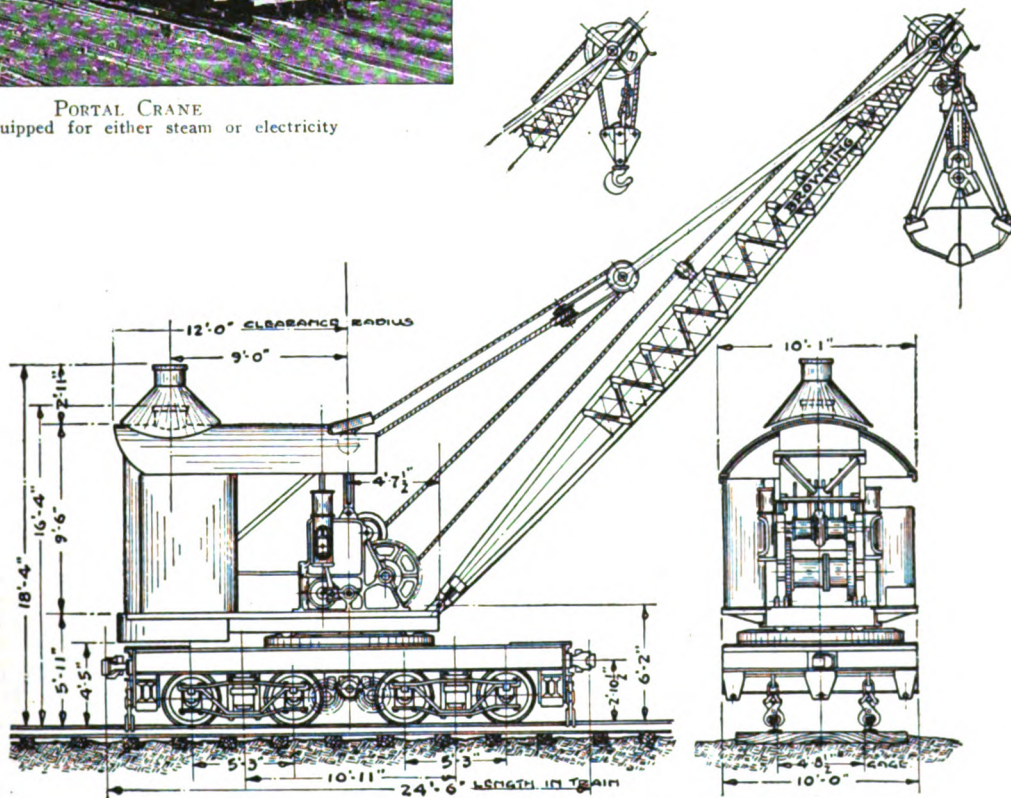
THE BROWNING COMPANY invites correspondence and questions on any type of work requiring machinery of this nature, and will furnish without charge complete information accompanied by photographs when possible.

Catalogues

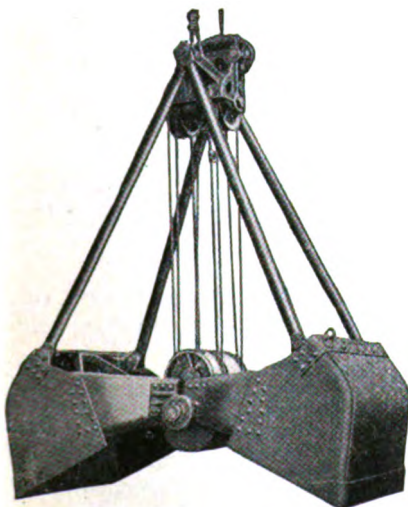
New catalogues of the Browning cranes and buckets which will show their wide adaptability and explain their economical operation, will be sent free on request.



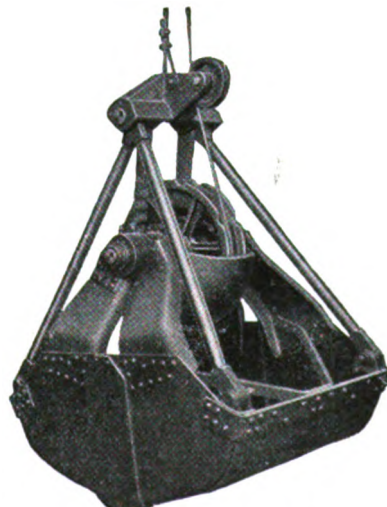
PORTAL CRANE
Can be equipped for either steam or electricity



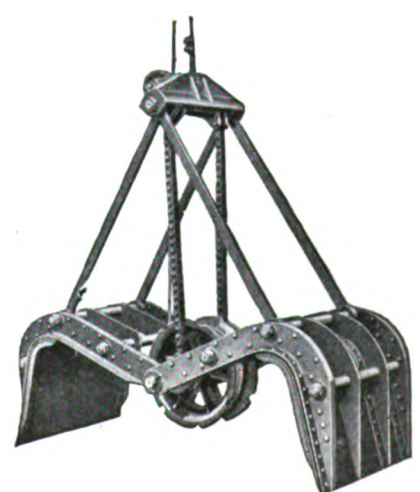
CLEARANCE DIAGRAM AND DETAILS OF BROWNING LOCOMOTIVE CRANE



BROWNING BUCKET, REEVED TYPE
A powerful digger recommended for work in very hard and lumpy materials



BROWNING BUCKET, FLAT CHAIN TYPE
A good bucket for handling coal and ashes: well built, and serviceable



WOOD GRAPPLE
For handling pulp wood and logs rapidly and economically. Correctly built to hold the largest load possible

ESTABLISHED 1873

INDUSTRIAL WORKS

Manufacturers of Cranes

BAY CITY, MICH.

BRANCH OFFICES

NEW YORK, N. Y., 50 Church Street
PHILADELPHIA, PA., 1309 Widener BuildingCHICAGO, ILL., 1001 McCormick Building
DETROIT, MICH., Book Building

CANADIAN AGENTS

MONTREAL, QUE., F. H. HOPKINS & Co., LTD.

TORONTO, ONT., F. H. HOPKINS & Co., LTD.

Products

LOCOMOTIVE CRANES for erecting, wrecking, and material handling; CRAWLING TRACTOR CRANES, (Gasoline Driven) for Road Contractors; COALING CRANES, (Gasoline Driven); PILE DRIVERS; GRAB BUCKETS.

Also, Gantry Cranes, Pillar Cranes, Transfer Cranes, Combination Crane-Pile Drivers, Portable Rail Saws, Pile Driver Steam Hammers, Lifting Magnets, Transfer Tables.

Experience and Scope

INDUSTRIAL WORKS, founded in 1873, utilizes in the manufacture of all their products the experience gained during 49 years of business. All materials are rigidly inspected in especially equipped chemical and physical testing laboratories. Every piece of "Industrial" machines is made from material that has been selected as preeminently suited for its purpose. Every "Industrial" Crane is built complete in their plant; the possibility that inferior parts will be furnished by some disinterested outside concern is eliminated. Strict adherence to all considerations of quality, including well developed designs, results in products that are unexcelled.

"Industrial" Locomotive Cranes

The system of clutches and independent drums makes "Industrial" Cranes unsurpassed for clamshell bucket work. Both drums are independent and the auxiliary take-up drum for the holding line is entirely automatic in its action, requiring no attention from the operator. With this drum he can raise the bucket open if desired.

Steam, gasoline or kerosene, electricity, and hand power may be used for operating Cranes. Capacities vary

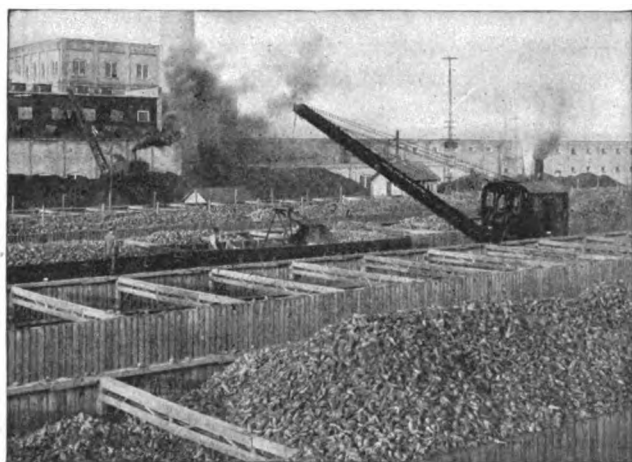


FIG. 1. TYPE G CRANES EQUIPPED WITH GRAB BUCKETS HANDLING SUGAR BEETS AND COAL

from 2 tons for the hand operated Pillar Crane up to 200 tons for the largest Wrecking Crane; booms vary between 20 and 140 ft.; 4-, 8- or 12-wheel cars for any gauge track can be furnished; and special mountings on boats or gantries are built to order.

These Cranes may be used with a grab bucket, hook and block, lifting magnet, or arranged for operating with a dragline bucket, pile driver leads, or a steam shovel dipper arm. The shelf-propelling Cranes can be used to shift several loaded freight cars at one time.

Small Cranes, 5- to 20-ton capacity, are largely used for loading and placing all kinds of material around industrial plants; 20- to 40-ton Cranes are very popular for both erection work and handling bulk material in large quantity with buckets or magnets; the 60-ton Cranes are chiefly used for erection purposes.

In general, the shorter the boom the easier and faster will be the operation of the crane. The modern American gondola car requires a 50-ft. boom to unload material from the far end.

Detailed information about radii and capacities is given in Table 1.

"Industrial" Crawling Tractor Crane (10-ton Capacity)

Operating independently of rails, the Type BC "Industrial" Crawling Tractor Crane is ideally adapted to the needs of road contractors, lumber and coal dealers, gravel, sand and stone producers, foundries, railroad reclamation and storage yards, and moderate size manufacturing plants.

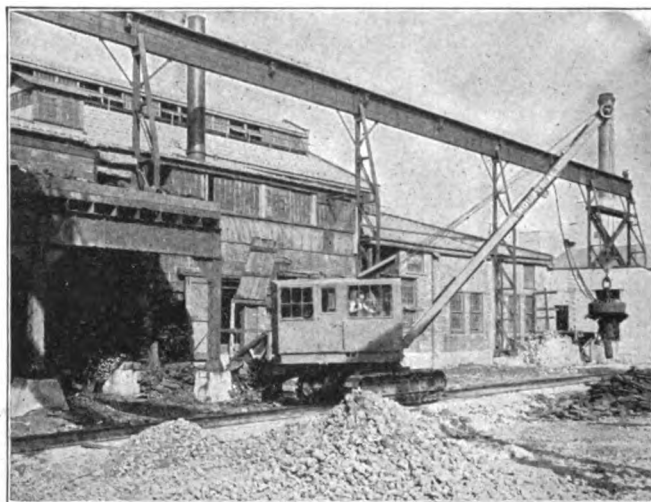


FIG. 2. TYPE BC CRAWLING TRACTOR CRANE

Depending on the purchaser's requirements, this Crane may be equipped either with crawling traction belts or four broad gauge tractor wheels.

The propelling and steering mechanism is a new and exclusive feature of the Type BC "Industrial" Crawling Tractor Crane. The steering of the car while propelling is under full control of the operator from his position in the revolving upper-works, *independently of all other motions*. Slewing is controlled by two friction clutches of very substantial design and is *entirely independent of all other motions*.

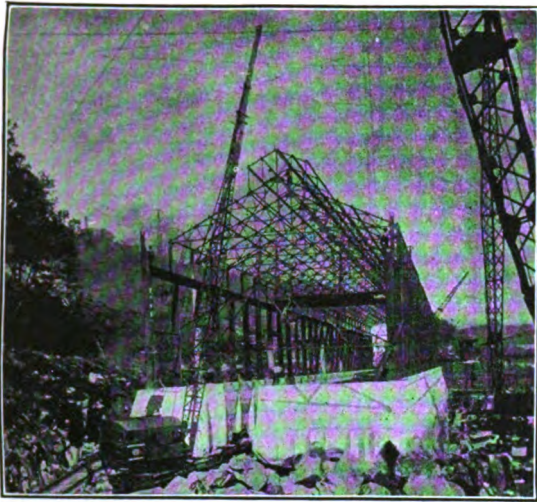


FIG. 3. TYPE K ERECTION CRANE OWNED BY THE BELMONT IRON WORKS
Erecting a plant for the Aluminum Co. of America

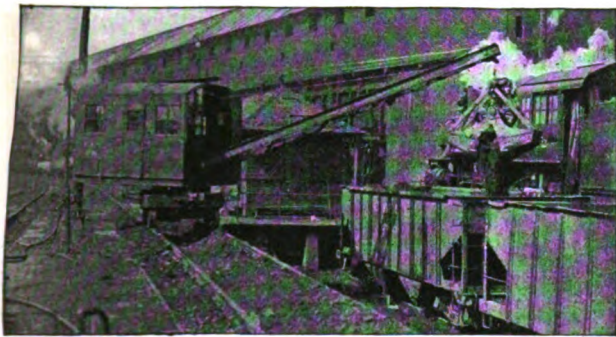


FIG. 4. TYPE A GASOLINE OPERATED CRANE
CLEANING OUT ASH PITS

TABLE I. WEIGHTS CAPACITIES AND RADII OF
"INDUSTRIAL" CRANES

Type of crane	Length of boom, ft.	Maximum weight of crane in operating condition, lbs.	Capacities without outriggers for maximum and minimum radii			
			Minimum radius		Maximum radius	
			ft.	lbs.	ft.	lbs.
A*	25	41300	10	10000	25	3000
A	25	59200	10	10000	25	3000
BC	30	50000	12	20000	30	6000
CA	40	93000	12	25000	40	5000
CA	45	94300	12	25000	45	3400
CB*	40	84700	12	25000	40	5000
CB*	45	86000	12	25000	45	3400
EA	40	110900	12	30000	40	7500
EA	45	111300	12	30000	45	6100
EA	50	111700	15	24500	50	4950
EB*	40	99000	12	30000	40	6100
EB*	45	99400	12	30000	45	4850
G	40	128850	12	40000	40	9000
G	45	129300	12	40000	45	7200
G	50	129500	15	31000	50	6100
G	60	130050	20	22000	60	4200
H	40	145350	12	50000	40	10200
H	45	145850	12	50000	45	8800
H	50	146350	15	37000	50	7500
H	60	147300	20	25000	55	5100
H	70	148300	25	18000	60	3200
KA	40	173500	12	60000	40	12400
KA	45	174050	12	60000	45	9900
KA	50	174400	15	44000	50	8400
KA	60	175100	20	30000	60	5800
KA	70	175800	25	21500	70	3800
KA	80	176500	30	16500	80	2400
KA	90	177200	35	12500	90	900
L	40	189250	12	70000	40	15000
L	45	189950	12	70000	45	12000
L	50	190450	15	51000	50	10000
L	60	191500	20	35000	60	6900
L	70	192550	25	25500	70	4700
L	80	193350	30	19500	80	3000
L	90	194250	35	15000	90	1500
L	100	195000	40	12000	100	.....
N	40	177450	16	39200	40	10700
N	50	178300	20	28200	50	6300
N	60	179400	25	19760	60	3360
N	70	180500	25	18400	70	1000
N	80	182700	25	15500	50	2000
N	90	184300	30	9700	50	900
N	100	185500	35	5500	45	1400

*4-wheel models; all other models have 8-wheel cars.

File Drivers

Fig. 5 shows "Industrial" No. 3 Pile Driver fitted with special folding leads. The leads fold back over the car, thereby obtaining clearance for bridges and tunnels. These Pile Drivers will be built to suit any special conditions or clearance diagrams.

Buckets

"Industrial" Power Wheel, Multi-Power and High Power Clamshell Buckets are used by construction men, coal dealers, powerhouse engineers and factory managers in all lines of work such as railways, steel plants, ore docks, refineries, chemical works, cement mills, smelters, etc.



FIG. 5. RAILWAY PILE DRIVER

Designed for rapid locomotive crane service—the hardest kind of bucket duty. "Industrial" Buckets are free from all inherent weaknesses of design. Weight has been reduced to a scientific minimum and every pound is located where it will be of greatest use. No excess weight to decrease efficiency.

All wear is taken on renewable bushings. Cutting edges are made of renewable hard alloy steel. The life of the Bucket is indefinite.

Catalogues

General Catalogue No. 109, Bucket Catalogue No. 111 or Book No. 113, descriptive of Type BC "Industrial" Crawling Tractor Crane will be forwarded on application.

TABLE II. APPROXIMATE RADII FOR FULL CLAMSHELL BUCKETS

Size of bucket, yds.	1½				2			
Capacity of crane, tons...	5	12	15	20	25	30	40	
Maximum radius with:								
Coal, ft.	20	25-37	41-46	48-52	49-52	52-54	58-61	
Sand, ft.	18	25-33	36-41	44-48	37-41	42-46	47-51	

A 1½-yd. bucket holds approximately 1 ton of coal.

Capacities with outriggers
For maximum and minimum radii

Minimum radius		Maximum radius	
ft.	lb.	ft.	lb.
13	40000	40	10200
13	40000	45	8600
15	31000	50	7000
20	23500	60	5500
14	50000	40	14000
14	50000	45	11500
15	47000	50	10000
20	35000	60	7000
25	27000	70	5000
15	60000	40	20500
15	60000	45	17000
15	60000	50	14500
20	45000	60	11000
25	35000	70	8000
30	28500	80	6000
35	23500	90	4000
16½	80000	40	25300
16½	80000	45	21500
16½	80000	50	18500
20	63000	60	14600
25	48000	70	11000
30	37200	80	8200
35	29900	90	6000
40	24400	100	4500
16	120000	40	37000
20	98000	50	26400
25	74000	60	19300
25	73200	70	13800
25	70000	80	9200
30	53000	90	5800
35	40000	100	3000

ORTON & STEINBRENNER CO.

Manufacturers of Locomotive Cranes

MAIN OFFICES

608 South Dearborn Street
CHICAGO, ILL.

WORKS, HUNTINGTON, IND.

NEW YORK, N. Y., J. ROSS BATES, 136 Liberty Street
PHILADELPHIA, PA., S. R. VANDERBECK, 20 S. 15th Street
CLEVELAND, OHIO, R. J. THOMAS, Sixth St. Clair Building
WATERTOWN, MASS., J. ROSS BATES, 128 School Street
DETROIT, MICH., B. L. WHITNEY, Detroit Savings Bank Building
PITTSBURGH, PA., E. E. BROSIUS, Benedum Trees Building
ST. LOUIS, MO., W. D. TULLEY, Title Guaranty Building
ST. PAUL, MINN., CONTRACTORS SUPPLY & EQUIPMENT CO., Guardian Life Building

NEW ORLEANS, LA., BUCKMASTER LUCK & MALOCHEE, Association of Commerce Building
DALLAS, TEX., W. A. BROWNING, 3027 Elm Street
DENVER, COLO., P. KRANFELD, 1707 Franklin Street
SALT LAKE CITY, UTAH, F. C. RICHMOND MACHINERY CO., W. 2nd Street
LOS ANGELES, CAL., WALTER HASENDAHL, 1213 Fuller Avenue
OAKLAND, CAL., SPEARS-WELLS MACHINERY CO., 239 W. 12th Street
PORTLAND, ORE., WESTERN RAILWAY SUPPLY CO., 15th and Johnson Streets

CANADA, THE HOLDEN CO., LTD., MONTREAL, TORONTO, WINNIPEG, VANCOUVER

Products

LOCOMOTIVE CRANES.

Also manufacturers of Gantry, Pier, Wharf and Barge Cranes; Railroad Pile Drivers; Drag Line Excavators; Steam Shovels.

For Buckets and Coal Crushers see page 42.

Catalogues

Completely illustrated and descriptive catalogues of the following equipment will be mailed on request:

No. 18. Standard and Special Gauge Locomotive Cranes.
No. 21. Road Wheel and Crawling Tread Cranes.



TYPE "N" 25-TON CRANE HANDLING BUCKET

Locomotive Cranes

Capacities—For convenience and uniformity, standard gauge cranes are generally rated in tons capacity at 12-ft. radius—that is, at 12 ft. from the center of the crane, and this capacity is used for determining the size of cranes required when heavy loads are to be handled. When handling coal or sand in bucket for example, the weight of the bucket plus the weight of the material in it will give the total load to be handled. (See table of weights of buckets on page 42.) By referring to the table of capacities the radius at which the load is to be handled will determine the size of crane required.

We manufacture cranes in the following sizes: 7, 12, 18, 22, 25, 30, 40, 50 and 60 tons capacity.

Mounting—For operating on standard gauge railroad tracks we build cranes with two standard MCB 4-wheel trucks or with only 4 wheels.

LIFTING CAPACITIES IN POUNDS OF ROAD WHEEL, CRAWLING TREAD AND STANDARD GAUGE LOCOMOTIVE CRANES

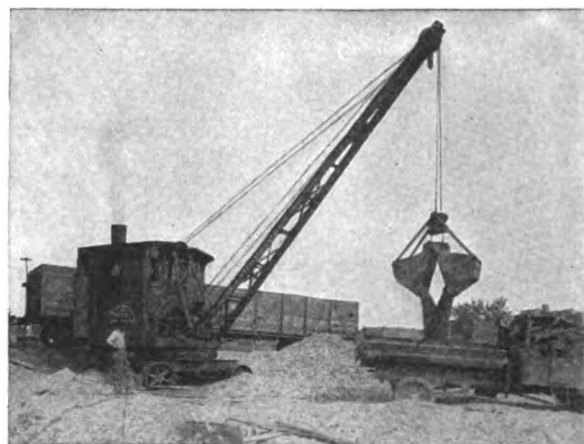
The following loads can be safely handled without the use of outriggers or other stabilizing devices.

Radius, ft.	7-ton	12-ton	18-ton	22-ton	25-ton	30-ton	40-ton	50 and 60-ton
10	18,000	30,700						
11	15,800	27,000	40,500					
12	14,000	24,000	36,000	44,000	50,000	60,000	66,000	70,000
14	11,400	19,700	29,400	35,900	40,800	49,000	53,900	57,300
15	10,400	17,900	26,800	32,800	37,200	44,800	49,400	52,400
17	8,900	15,300	22,800	27,900	31,700	38,100	42,000	44,700
20	7,200	12,400	18,500	21,600	25,700	31,000	34,200	36,400
25	5,500	9,700	13,900	17,000	19,300	23,400	25,800	27,600
30	4,400	7,700	11,500	13,400	15,200	18,500	20,500	21,900
35	3,500	6,300	9,400	11,600	12,400	15,200	16,700	18,000
40	2,900	5,200	7,900	10,000	11,000	13,500	14,000	15,100
45	2,300	4,400	6,700	8,600	9,400	11,500	12,800	13,400
50	1,900	3,700	5,600	7,100	8,200	10,100	11,200	11,600
55	1,500	3,100	4,700	6,100	7,000	8,700	9,600	10,000
60	1,200	2,600	3,900	5,200	6,000	7,500	8,300	8,700

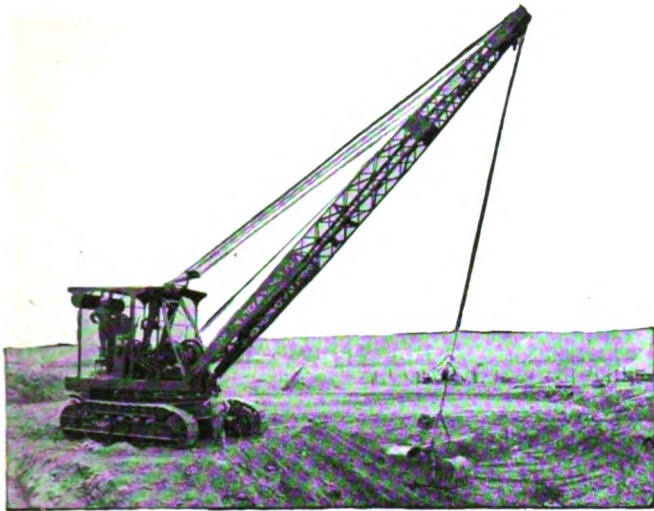
With outriggers extended the capacities of 25-ton and smaller sizes of rail cranes are increased 50%; the capacities of the 30-ton and 50-ton cranes are doubled; the capacities of the 40-ton crane are the same as for the 30-ton crane; and the capacities of the 60-ton crane are two and a half times as great as given in the above table for the 30-ton crane.

All lifting capacities of standard gauge locomotive cranes are calculated according to the established standard of the Locomotive Crane Manufacturers Association.

Railroad cranes are also manufactured for operation on wide or special gauge tracks. For traveling on ground we supply our 7- and 12-ton sizes with either broad face traction wheels or continuous crawling tread. Revolving superstructure of cranes may also be mounted on flat cars, or on piers, wharfs, barges or gantry structures.



TYPE "U" 7-TON ROAD WHEEL CRANE LOADING TRUCKS



TYPE "W" 12-TON GASOLINE CRAWLING TREAD CRANE OPERATING DRAGLINE

Power—At the option of purchaser either steam, gasoline or electric power is supplied—each kind of power having some advantages over the others, depending on the conditions surrounding the installation. However, the steam type will be found in most cases to be the most versatile and dependable of the several types.

When steam engines are supplied, A. S. M. E. boiler of ample steaming capacity is included and it may be equipped for either coal, wood, or oil burning.

In the electric type we supply either direct or alternating current special crane motors. They are of the slip ring type and in most cases have reversible drum type controllers and cast grid resistances. Current is taken in by means of either plug-in cable arrangements or third rail and collector shoes. This type of crane is suitable for use in yard or where current is convenient; it is, therefore, limited in its radius of operation.

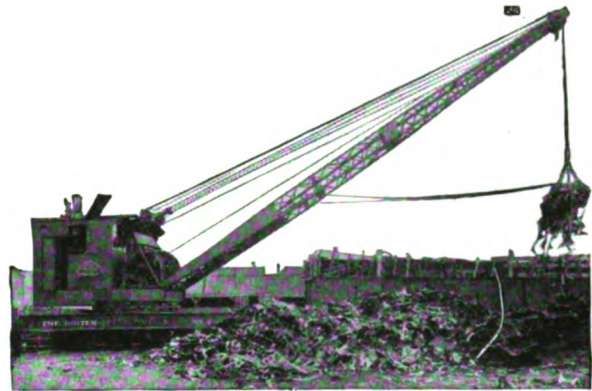
For gasoline consumption we install the latest type heavy duty 4-cylinder internal combustion engine. It

is supplied with all the necessary accessories including carburetor, magneto, radiator, pump, fan, etc. This type of power is particularly suitable when crane is used in intermittent service.

Equipment—Standard equipment includes full steel cab, enclosing operator and principal machinery; automatic bucket-handling drums, bronze bushed bearings throughout, bronze friction clutches, all car ballast in place, fall block, and the services of our expert superintendent to take charge of installation and instruct purchaser's operator.

Various other devices such as generator set for exciting electro magnet, pile driver leads for handling steam or drop hammer, locomotive air brakes, fair lead for handling dragline bucket, or lighting equipment for night work, etc., may readily be installed and are furnished when required.

Repairs—All machines are manufactured on the interchangeable duplicate part system and repair parts can be readily installed in field. All wearing parts are bronze bushed and adequately lubricated. Complete stock of parts is kept on hand and in most cases can be shipped the same day order is received.

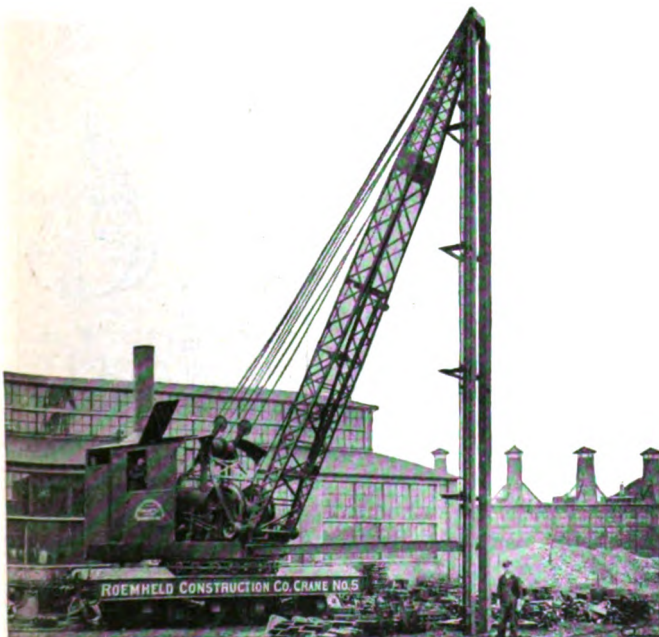


TYPE "D" 22-TON CRANE HANDLING SCRAP WITH MAGNET

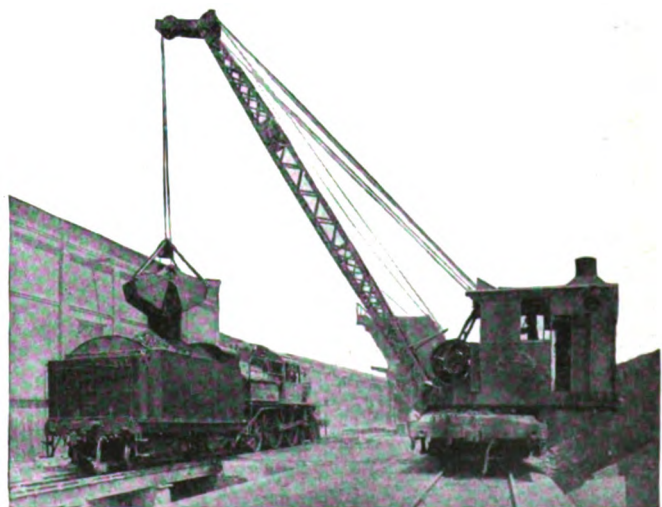
Inquiries

In order to enable us to quote intelligently on any installation the inquiry should state:

- (1) Type of mounting, whether rail wheels, road wheels or crawling tread.
- (2) Kind of power preferred; if electric, state type of current and voltage.
- (3) Capacity at minimum and maximum radii.
- (4) Kind of work required, i. e., bucket, magnet, fall block, dragline, etc.
- (5) Special attachments desired.



TYPE "B" 18-TON CRANE WITH PILE DRIVER LEADS



TYPE "B" 18-TON CRANE COALING LOCOMOTIVE

BLAW-KNOX COMPANY

Manufacturers of Steel Products

GENERAL SALES OFFICES
PITTSBURGH, PA.

EXECUTIVE OFFICES
BLAWNOX, PA.

DISTRICT SALES OFFICES

BALTIMORE, MD., Bayard and Warner Streets
BIRMINGHAM, ALA., American Trust Building
BOSTON, MASS., Little Building
CHICAGO, ILL., People's Gas Building

DETROIT, MICH., Lincoln Building
NEW YORK, N. Y., 30 East 42nd Street
SAN FRANCISCO, CAL., Monadnock Building
LONDON, ENGLAND

WORKS: BLAWNOX, PA.

Products and Service

SECTIONAL STEEL BUILDINGS; CLAMSHELL BUCKETS; FABRICATED STEEL; STEEL PLATE WORK; FURNACE APPLIANCES; TRANSMISSION TOWERS; STEEL FORMS.

Blaw-Knox Service is a part of every Blaw-Knox product. Engineering skill and experience brought to bear on individual problems insure adaptation of every Blaw-Knox product for specific needs.

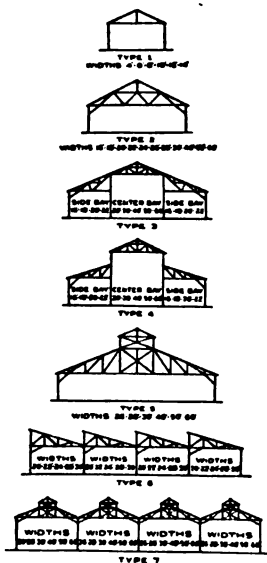
Blaw-Knox Prudential Sectional Steel Building

Light steel buildings made from galvanized steel sheeting which is specially formed to give the utmost resistance to stresses, erected on a shop riveted structural steel frame. Shipped in assembled sections.

Patented interlocking construction, non-corrosive, fireproof and moistureproof, 100% salvage value. All parts standard, equipped with doors, windows, steel sash, ventilators and skylights in great variety.

Sizes: Widths from 8 to 60 ft. single span; heights 8, 10 and 12 ft. Any lengths. Variations: Plain roofs or with monitors, with or without 20 ft. lean-tos.

Blaw-Knox Handy-houses—For every use. Sizes: 5x5x8 ft. to 14x50x8 ft. Quixet (quick set) single, double and multiple garages.



SECTIONAL STEEL BUILDINGS

Blaw-Knox Clamshell Buckets

"A bucket for every purpose" is the Blaw-Knox bucket slogan. Standard varieties include single-line, two-line, three-line and four-line clamshells for all work from the lightest rapid rehandling to the most difficult digging and dredging.

Single rope automatic cableways; buckets for handling coal, open hearth slag, sand, stone; dredgers for subaqueous work; buckets for digging hard packed clay and other obstinate material; special buckets for the foundry; low headroom buckets for the overhead crane.

You specify the rig and the work and we will furnish a bucket to exactly meet requirements.

The Speedster—A speedy, highly developed lever arm bucket designed for the fast rehandling of loose bulk materials and the loading and unloading of cars. Operates with utmost efficiency in coal, sand, stone, gravel and similar materials. Made in a variety of sizes applicable to all types of overhead or locomotive cranes or derricks.



The Bulldog—A heavy, compactly built bucket designed for the rehandling of materials of a heavy and obstinate nature. Especially adapted to steel plant work, such as the rehandling of broken limestone, slag, scrap, heavy ores, steel turnings, or for working in skull cracker pits. Built to stand the most severe usage, the Bulldog is unsurpassed for heavy rehandling purposes.

The Dreadnaught—The supreme bucket for heavy excavating and dredging. Manufactured in many sizes applicable to nearly every type of hoisting equipment. The most difficult excavating or heaviest dredging can be handled to your entire satisfaction with a Dreadnaught. It is a speedy bucket; enormous closing power makes it advantageous for rehandling work.

The Single Line—A "hook-on" type bucket completely operated by a single hoisting drum. The yoke of the closing line can be thrown over the crane hook when the bucket is needed and it is ready for service immediately. The yoke is thrown off the hook when the bucket work is finished and the crane is ready for other uses. Where headroom is low, the Blaw single-line bucket can be reeved direct to the hoist.

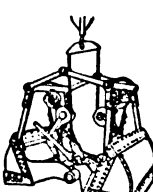
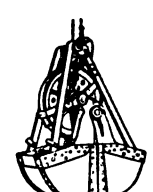
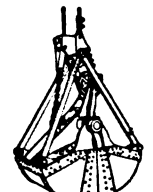
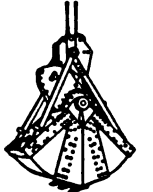
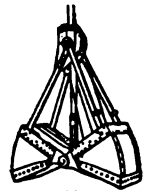
The Power Wheel—A general utility bucket for light rehandling. Made in a number of sizes adapted to every make of small portable crane, it is especially suitable for the rehandling of sand, gravel and other concrete aggregates. Of light weight, yet durable construction. Great closing power is obtained by the unique mounting of an unusually large power wheel.

The Foundry—A single line "hook-on" bucket for foundry use, wide spreading, quick acting; a low headroom bucket designed for the mixing and cutting of moulders' sand and the rehandling of coal and coke. Made in a number of sizes for installation on overhead cranes for foundry use or wherever low headroom buckets are needed.

Four Line and Special Buckets—For every rig and every class of service.

Blaw-Knox Fabricated Steel Work

Fabricated steel for buildings, crane runways, manufacturing plants, mill buildings, bridges, steel poles,

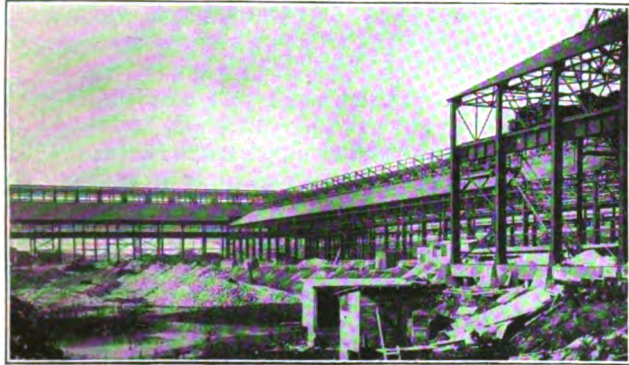


CLAMSHELL BUCKETS

trusses and miscellaneous construction, has been a Blaw-Knox specialty for many years.

Long experience, excellent shop and shipping facilities combined with a corps of engineers specialized in this line of work have given Blaw-Knox fabricated steel products an enviable reputation and established the company in the first rank as fabricators.

Capacity 3000 tons per month.



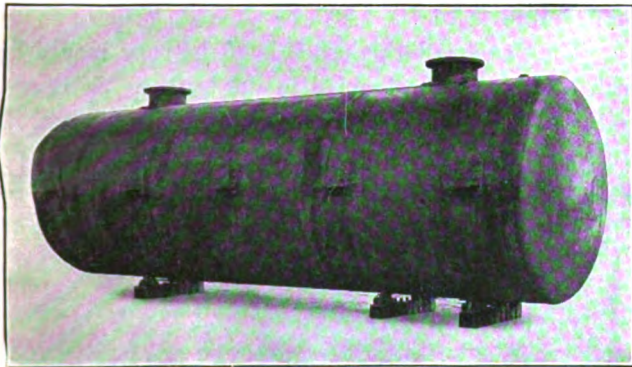
STRUCTURAL STEEL BUILDINGS DESIGNED AND FABRICATED BY
BLAW-KNOX COMPANY

Blaw-Knox Steel Plate Work

We have one of the largest and best equipped shops in the country for the production of all varieties of steel plate work. Riveted plate work of every description. Welding by any one or combination of three methods, oxy-acetylene, electric and hammer.

Situated in the center of the steel world, our facilities for obtaining prompt delivery of raw material and making timely shipments are unexcelled.

Capacity 2000 tons per month.



BLAW-KNOX FORGE AND HAMMER WELDED TANK

Blaw-Knox Forge and Hammer Welding

Wherever high temperatures and extremes in expansion and contraction or a combination of both are encountered, forge and hammer welded construction is a necessity. Forge and hammer welded equipment is being universally adopted for processes demanding both bottletight construction and a strength at the weld approximating that of the original plate.

We offer the services of a completely equipped forge and hammer welding plant and our specialized engineering staff for the design and construction of hammer welded steel plate work of any character.

Blawforms for Concrete Construction

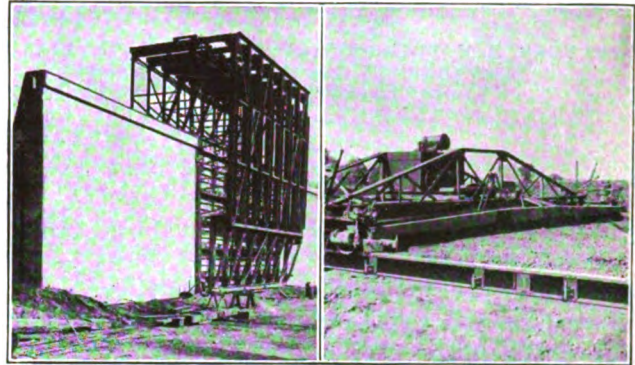
Steel forms for every type of concrete construction. Road, curb and gutter, sidewalk forms and accessories.

Building forms for floors, ceilings and columns.

Light wall forms for foundations, tanks, light walls, grain elevators, coaling stations, reservoirs, silos, etc.

Traveling and collapsible forms for heavy retaining walls, piers, dams, culverts, shafts, tunnels, sewers, subways and all manner of conduits.

Steel centers for concrete bridges.



BLAW-KNOX TRAVELING
WALLFORM

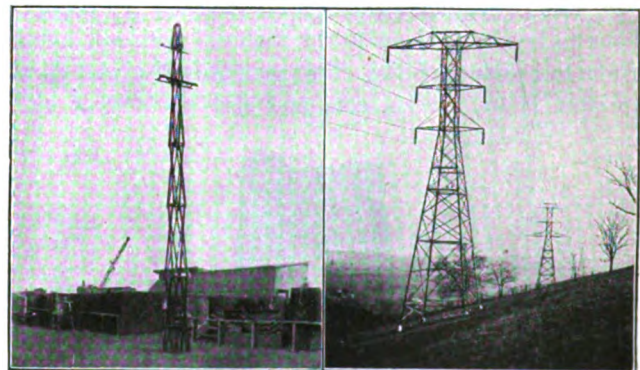
BLAW-KNOX ROAD FORMS
SHOWING SUPPORT AFFORDED
HEAVY FINISHING MACHINE

Blaw-Knox Transmission Towers and Poles

From coast to coast on both continents, Blaw-Knox transmission towers will be found carrying energy to industry and the waiting millions.

Blaw-Knox transmission towers are designed for particular requirements of each transmission line, by engineers who have devoted their careers to the development of steel towers and poles for power transmission.

We are prepared to design and furnish four-legged straight line or suspension towers, anchor and angle towers, A-frames, river crossing towers, wireless towers and catenary supports for railroad electrification; also patented steel poles for lighter high tension lines and distribution lines for telegraph, telephone, wireless and catenary supports.



BLAW-KNOX PATENTED
POLE

BLAW-KNOX TRANSMISSION
TOWERS

Blaw-Knox Furnace and Mill Equipment

Knox patented water cooled doors, frames, front and back wall coolers, buckstays, ports, skewbacks, reversing valves, etc.

Sheldon mechanical gas producers.

McKune system of open hearth furnace construction.

The Mowry dolomite gun.

Sheet and tin mill equipment, water cooled floors, shields and boshes, palm-oil plants, sheet bar carriers, scrap buckets, acid tanks, galvanizing kettles, grease pots, cooling tables, terne pots, annealing pots and covers, etc.

THE BROWN HOISTING MACHINERY CO.

Manufacturers of Grab Buckets

CLEVELAND, OHIO

BRANCH OFFICES

NEW YORK, N. Y., 50 Church Street

CHICAGO, ILL., 208 South La Salle Street

PITTSBURGH, PA., Oliver Building

NEW ORLEANS, LA., Whitney-Central Building

SAN FRANCISCO, CAL., Monadnock Building

EUROPEAN REPRESENTATIVE, H. E. HAYES, 12 Rue de Phalsbourg, PARIS, FRANCE

Products

BROWNHOIST GRAB BUCKETS.

Also manufacturers of Storage Bins; Transfer Tables; Ferroinclave, a combined Reinforcement and Centering for concrete roofs, stairs, bins, floors, etc.

For Locomotive Cranes, see pages 24-25; for Suspended Bins, Coal and Ash Handling Machinery, see page 838.

Types

Three general types of Brownhoist buckets are built: The patent grab bucket which includes the coal bucket (Fig. 1), and the special grab bucket (Fig. 3); the clamshell bucket (Fig. 2); and the dragline bucket (Fig. 4).

Brownhoist Grab Buckets

These buckets are made to dig in coal, gravel, sand, crushed stone, cinders, ore, etc., and will excavate in ordinary soil. An excavating bucket is built for digging in stiff materials.

The Brownhoist bucket is so designed that it does not have to be dropped on to the material with pile hammer force to insure its filling. This results in the least damage to cars, boats, trucks, etc., and also saves wear on the

BROWNHOIST
TRADE-MARK

bucket. Another important feature of this bucket is the wide spread of the spades when open, which gives a greater digging power than a bucket of the same capacity but with a shorter spread of the spades.

Operation—The Brownhoist patent grab bucket is a two-rope bucket and can be operated on any two-drum machine. The two ropes, the closing and the holding ropes, are so spaced that there is little tendency for the bucket to twist while being hoisted and lowered.

Brownhoist Clamshell Buckets

Simplicity of construction is one important feature of the Brownhoist clamshell bucket. It has fewer parts than any other bucket and many of these are duplicates and therefore interchangeable. It is a fast operating bucket that is well suited to handle practically all kinds of materials.

The Brownhoist clamshell is of the rope-reeved type with both ropes dead-ended in the bucket. It is easily and quickly put on any type of two-drum machine. The rope-reeved system of closing this bucket gives a powerful closing action, and all sizes of the clamshell are fitted with four parts of closing line.

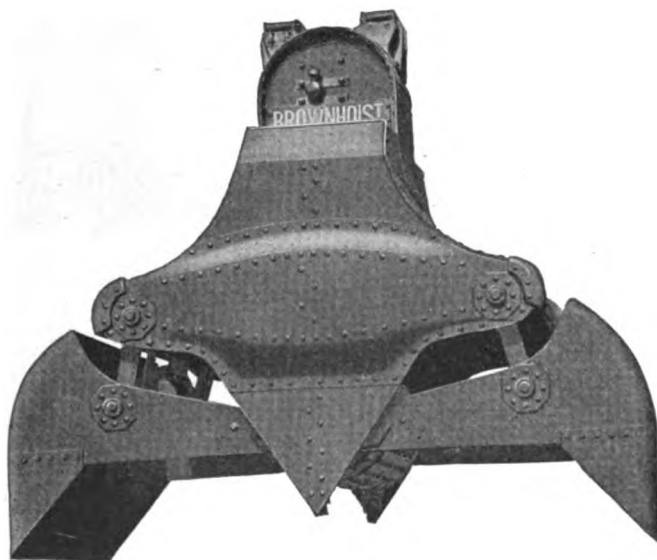


FIG. 1. BROWNHOIST LINK-TYPE GRAB BUCKET WITH COAL SPADES

This bucket is made with coal or ore spades, depending on material to be handled

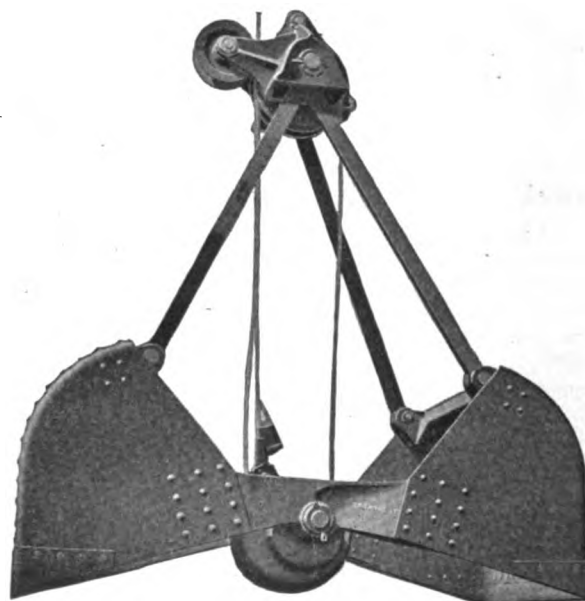


FIG. 2. BROWNHOIST CLAMSHELL BUCKET
These buckets have four parts of closing line

When open, the over-all dimensions of this clamshell are the width and spread of the spades or scoops. This permits the bucket to get right up into the corners of cars, bins, etc., and saves the large amount of cleaning-up by hand shovelers which is necessary with many buckets.

Manganese steel nose plates take all of the wear on the cutting edges and these can be replaced when worn. Large size sheaves are used and this, together with the fact that there are no sharp "S" bends for the ropes, reduces rope wear to a minimum. The bearing surfaces are bronze bushed and special provision is made for easy lubrication of these bearings.

The great simplicity and few parts in the Brown-hoist clamshell make it an easy bucket to get at and keep in repair. Hard work makes repairs necessary to any bucket in time and being able to make these changes on the job when they are needed means the saving of time and money.

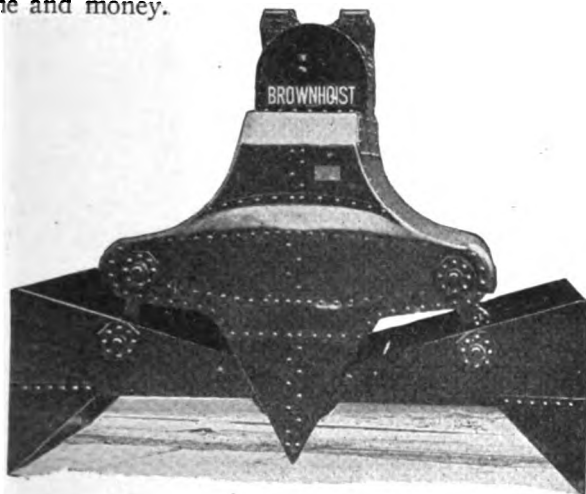


FIG. 3. BROWNHOIST LINK-TYPE GRAB BUCKET
With backs of spades left open for handling ore and for doing excavating work

Brownhoist Dragline Bucket

A back-dumping bucket. It is operated by two lines, dragline and hoist-line.

All standard buckets are equipped with steel cutting edge and two-part teeth. Each tooth is tipped with a manganese steel point. There are three types of points—which one to use depends



FIG. 4. BROWNHOIST (SHNABLE PATENT) DRAGLINE BUCKET

upon whether bucket is to work in loose digging, hardpan, or rock. Inquiries must state class of work.

DRAGLINE BUCKETS, FIG. 4

Type	Code word	Capacity, cu. yds.	Width of cutting edge, ft.	Net weight, lbs.
A-1	Ramab	1	3 0	2850
A-2	Ramac	1½	3 6	4550
A-3	Ramad	2	4 2	5650
A-4	Ramaf	2½	4 10	6850
A-5	Ramaj	3	5 4	8200
A-6	Ramak	3½	5 10	9600

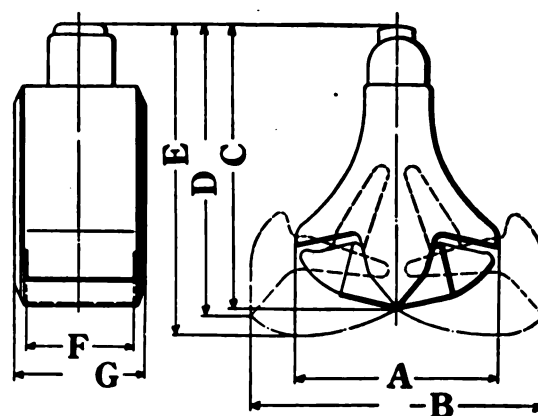


FIG. 5. DIAGRAM OF BROWNHOIST BUCKETS
Showing dimensions

BROWNHOIST COAL BUCKET, FIGS. 1 AND 5

Type	Code word	Capacity, cu. ft.	A	B	C	D	E	F	G	Net weight of bucket, lbs.	Shipping measurement, cu. ft.
CG1	Rebac	27	5 5	7 11	6 10	7 0	7 7	3 2	3 8	3300	135
CG2	Rebed	40	6 1	8 9	7 5	7 9	8 3	4 0	4 8	4100	210
CG3	Rebif	54	6 9	9 8	7 10	8 0	8 9	4 5	5 1	4600	268
CG5	Rebuh	70	7 5	11 0	8 2	8 6	9 3	4 5	5 0	6000	303
CG6	Rebyk	84	8 1	12 1	9 4	9 8	10 6	4 5	5 2	8000	389
CG7	Rebwa	100	8 6	11 10	8 6	8 10	9 6	5 5	6 1	7500	435
CG12	Rebba	110	8 6	12 9	8 3	8 4	9 3	5 3	5 11	7800	400
CG13	Rebec	180	9 7	14 5	11 5	11 7	12 6	6 0	7 0	10000	765
CG14	Rebka	230	11 11	17 8	12 10	13 2	14 5	6 6	6 6	13625	990
CG15	Rebno	260	11 10	17 7	13 4	13 9	14 11	7 8	8 8	15800	1360
CG16	Rebei	360	11 10	17 7	13 4	13 9	14 11	9 0	10 0	17980	1580

BROWNHOIST ORE BUCKETS, FIG. 5

Type	Code word	Capacity, cu. ft.	A	B	C	D	E	F	G	Net weight of bucket, lbs.	Shipping measurement, cu. ft.
OG1	Rabab	17	6 1	8 9	7 5	7 9	8 3	4 0	4 8	3900	210
OG2	Rabee	27	6 7	9 7	7 10	8 0	8 9	4 5	5 1	4400	262
OG3	Rabid	40	7 5	11 0	8 2	8 6	9 3	3 10	4 5	5800	268

EXCAVATING BUCKETS, FIG. 5

Type	Code word	Capacity, cu. ft.	A	B	C	D	E	F	G	Net weight of bucket, lbs.	Shipping measurement, cu. ft.
EG1	Ribad	40	6 9	9 7	7 4	7 7	8 3	4 5	5 1	4400	242
EG2	Ribef	54	7 6	10 10	7 9	8 1	8 9	3 10	4 6	5300	263
EG3	Ribig	66	9 8	13 10	9 9	10 0	11 0	3 3	3 11	5550	390
EG4	Riboh	80	9 8	13 10	10 11	11 3	12 2	3 10	4 10	8700	510
EG5	Ribuk	115	11 10	17 6	13 1	13 5	14 8	5 0	6 0	12800	1412

SPECIAL GRAB BUCKETS, FIGS. 3 AND 5

Type	Code word	Capacity, cu. ft.	A	B	C	D	E	F	G	Net weight of bucket, lbs.	Shipping measurement, cu. ft.
B1	Ritab	27	6 10	10 8	7 10	7 9	8 7	2 11	3 7	5800	190
B2	Ritak	40	7 11	11 9	8 1	8 3	9 0	4 2	4 11	7780	330

CLAMSHELL TYPE BUCKETS, FIGS. 2 AND 5

Type	Code word	Capacity, cu. yds.	A	B	C	D	E	F	G	Net weight of bucket, lbs.
Z2		¾	5 0	7 0	7 3	8 0	8 1	3 2	3 4	2400
Z3		1	5 8	7 4	7 7	8 7	8 8	3 2	3 4	2550
Z4		1½	6 3	8 9	8 4	9 3	9 4	3 6	3 8	3900
Z5		2	6 9	9 6	8 8	9 8	9 8	4 1	4 3	4750

Prices furnished on application.

THE HAYWARD COMPANY

Manufacturers of Orange Peel and Clam Shell Automatic Buckets, Drag Scraper and Electric Motor Buckets

Hudson Terminal Building
NEW YORK, N. Y.

Products

ORANGE PEEL BUCKETS, CLAM SHELL BUCKETS, DRAG SCRAPER BUCKETS, ELECTRIC MOTOR BUCKETS, HAYWARD COUNTERWEIGHT DRUMS, GRAPPLES.

Also manufacturers of Skid Excavators, Coal Handling and Dredging Machinery.



Trade **HAYCO** Mark

Service

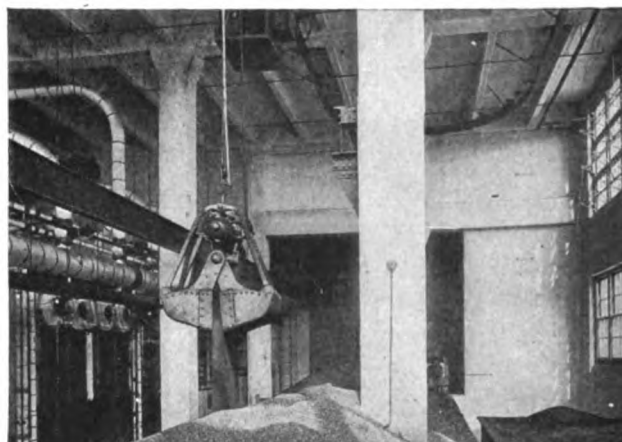
The automatic bucket—originally considered a digging or loading machine—has developed a much wider field and today is also part of the conveying and rehandling systems of foundries, steel mills and power plants.

No single machine has been more generally adopted in the universal effort to handle bulk material more economically by mechanical means.

The succeeding pages merely suggest a few of the many applications of Hayward buckets to construction and industrial problems.

These typical examples may in some instances parallel conditions existing in your plant and hence demonstrate sufficiently the adaptability of Hayward buckets. If not, the Hayward engineers will be glad to co-operate in solving material handling problems most efficiently and economically.

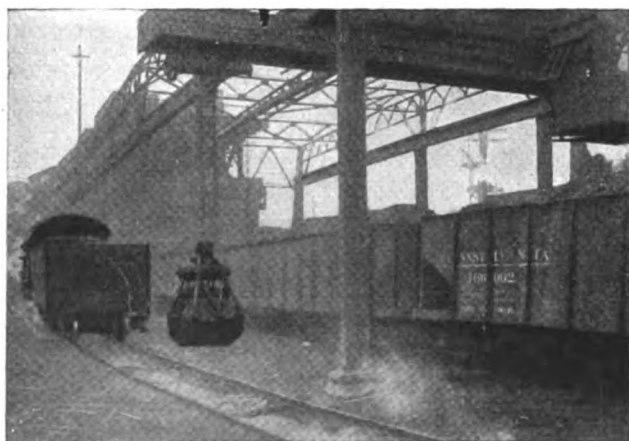
Bulletins on particular classes of work and recommendations on individual problems will gladly be sent without the request incurring the slightest obligation. Over forty years of bucket building experience and ample manufacturing facilities are at your disposal.



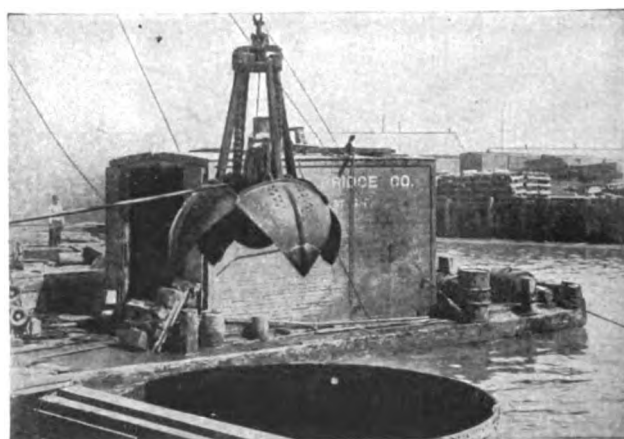
No. A-2456. HAYWARD ELECTRIC MOTOR BUCKET
Rehandling fuel in a boiler room from car to bunkers



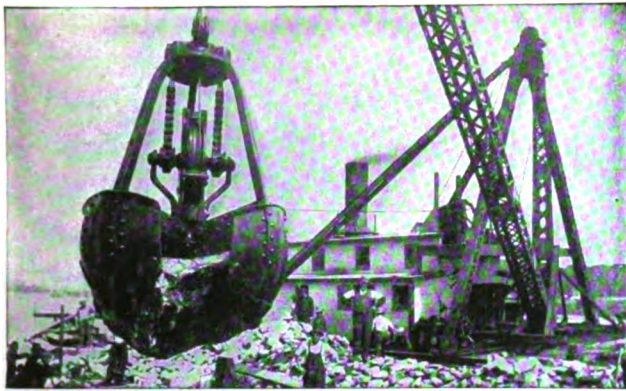
No. A-904. HAYWARD CLASS "E" CLAM SHELL BUCKET
On a mast and gaff rig, unloading coal from barge and dumping into hopper



HAYWARD ELECTRIC MOTOR BUCKET
In railroad ash pit service



No. A-2648. HAYWARD ORANGE PEEL BUCKET
Excavating material from within a caisson as it is being sunk



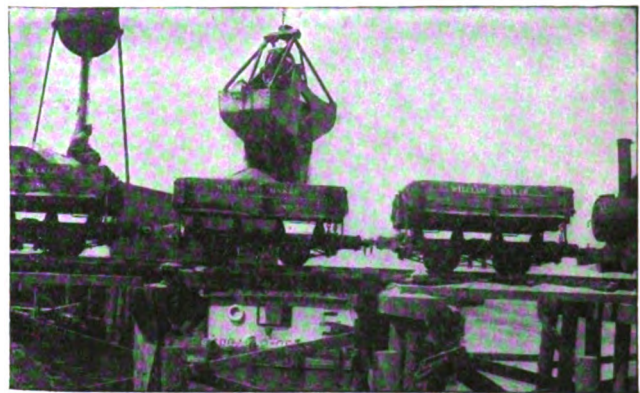
No. A-2358. HAYWARD 3-SIDED ORANGE PEEL BUCKET WITH CUT-OFF BLADES
Handling a boulder larger than itself



No. A-1645. HAYWARD CLASS "H" MULTI-POWER CLAM SHELL BUCKET (1½ CU. YDS.)
Working between sheeting 10 ft. apart and digging in sand, loam and gravel



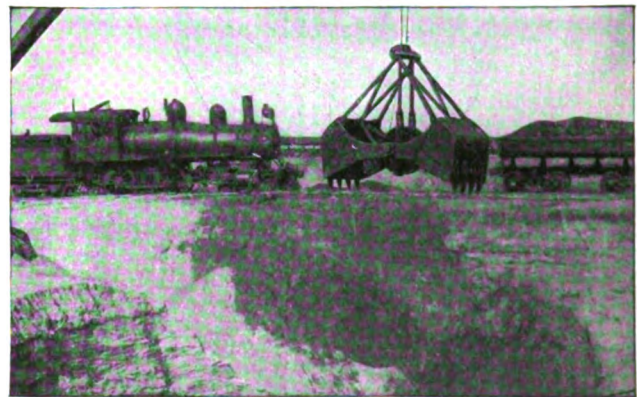
No. C-495. HAYWARD ELECTRIC MOTOR BUCKET (3 CU. YDS.)
Loading broken open hearth slag into cars



No. A-1675. HAYWARD CLAM SHELL BUCKET WITH ORE BOWL
Rehandling contractor's materials. Note the clean, accurate dump



No. C-355. HAYWARD CLAM SHELL BUCKET
Unloading crushed stone from barges



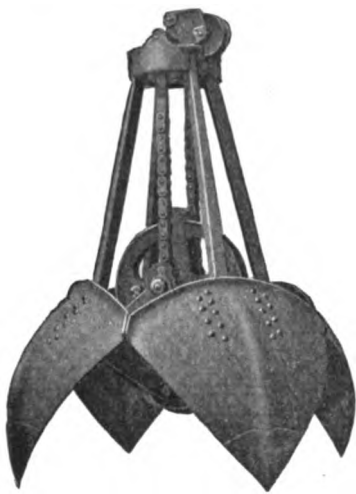
No. A-1927. HAYWARD CLAM SHELL BUCKET WITH ORE BOWL
Fitted with teeth for digging in hard packed sand or other compact materials



No. A-2439. HAYWARD SPECIAL CLAM SHELL BUCKET (6-TON CAPACITY)
Operating on bridge unloading coal



No. A-1839. HAYWARD DRAG SCRAPER BUCKET
Digging in hard-pan. Note the full load cleanly carried



No. A-794. HAYWARD STANDARD ORANGE PEEL BUCKET

A 2-line bucket for general contractors' use. Recommended for dredging, excavating and rehandling bulk materials. Sizes from 2 cu. ft. up



No. A-798. HAYWARD MULTI-POWER ORANGE PEEL BUCKET

An extra heavy digging bucket with a 2-part side chain which gives nearly 60% more penetrating power. Sizes from 2 cu. ft. up



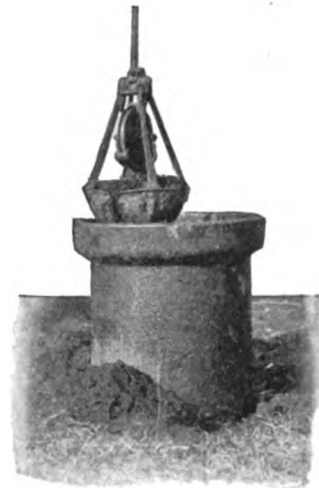
No. A-2515. HAYWARD 3-SIDED ORANGE PEEL BUCKET

Designed primarily to handle blasted rock and other hard and odd-shaped material, but is also an all around digging bucket. Sizes from 21 cu. ft. up



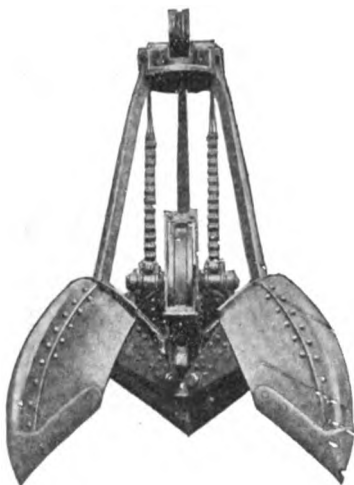
No. A-2503. HAYWARD ROPE REEVED ORANGE PEEL BUCKET

The latest model of the original Hayward bucket. Closing power is varied to suit conditions. Arranged to close by 3, 4, 5, 6 or 7 parts of line and to be operated in the bight of the line or direct. Sizes from 21 cu. ft. up



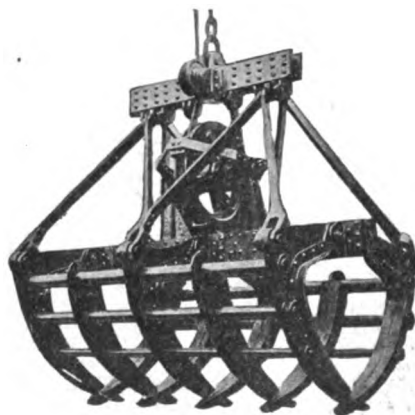
No. D-939. HAYWARD DWARF ORANGE PEEL BUCKET

A hand-operated miniature of the large orange peel buckets. Will dig inside a 12-in. pipe—the depth only limited by the length of the operating lines. Sizes from 100 cu. in. to 1 cu. ft.



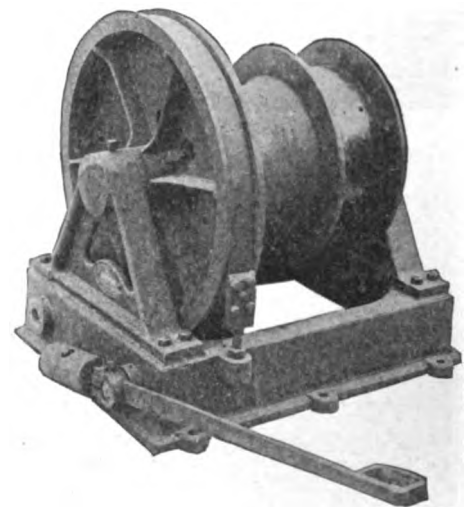
No. A-1943. HAYWARD EXTRA HEAVY 3-SIDED ORANGE PEEL BUCKET WITH CUT-OFF BLADES

The heaviest type (outside of special buckets) of orange peel, made for handling rock and specially reinforced for severe usage



No. A-159-a. HAYWARD GRAPPLES

Made in various styles for handling irregular-shaped bulk material such as logs, stumps, sugar cane, tin scrap, cord wood and similar uneven material



No. A-947. HAYWARD COUNTERWEIGHT DRUM

Takes the place of an additional drum on the engine. Is not connected to hoisting engine so may be placed in any convenient location for leading the holding line to the bucket and the counterweight line to the counterweight. Band brake operated by foot or hand lever



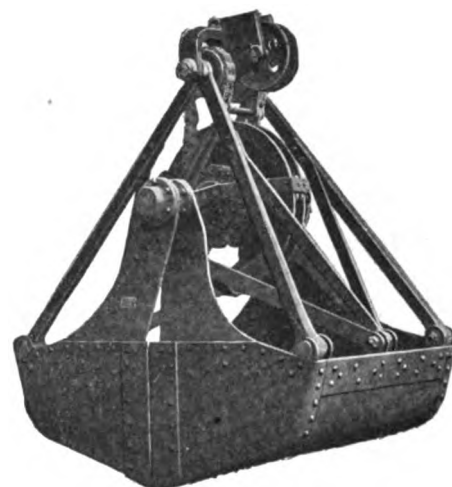
No. A-2565. HAYWARD CLASS "E"
CLAM SHELL BUCKET WITH
REGULAR BOWL

The light "E" bucket is recommended for handling coal and other light, loose materials; the heavy "E" for dredging. The shape of the bowls allows a gradual yet rapid discharge. Sizes from $\frac{1}{2}$ cu. yd. up



No. A-719. HAYWARD CLASS "E"
CLAM SHELL BUCKET WITH
ORE BOWL

In proportion to size, ore bowl buckets carry larger loads and will dig harder materials than regular bowls, owing to their shovel-like shape. Sizes from $\frac{1}{2}$ cu. yd. up



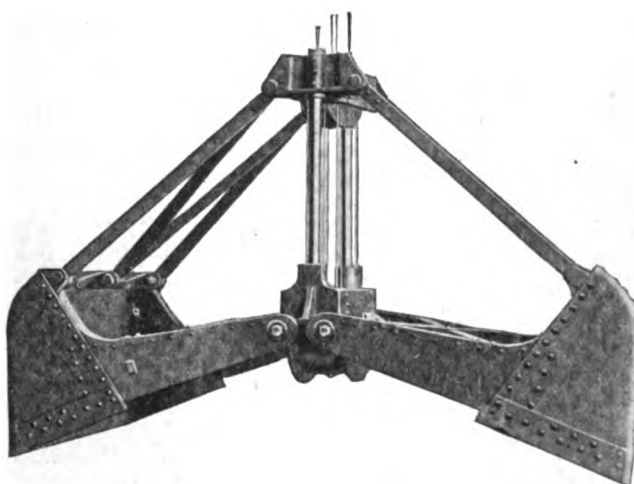
No. A-1037. HAYWARD CLASS "H" CLAM
SHELL BUCKET

Has 60% more closing power than a Class "E" bucket and thus is slower, but the penetration is much greater and there is less tendency to lift while closing. Sizes from $1\frac{1}{2}$ cu. yds. up



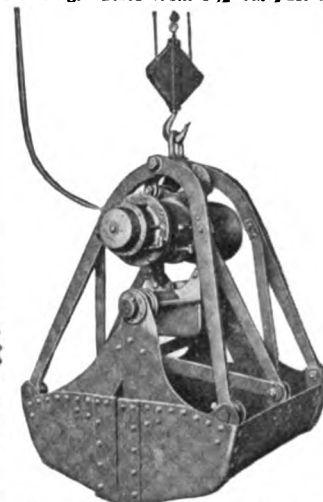
No. A-1323. HAYWARD CLASS "G"
CLAM SHELL BUCKET WITH
ORE BOWL

A rope reeved bucket. May be operated in bight of the line and practically twice the load handled without increasing size of hoisting engine. Advantageous on cableways, as no headroom is lost. Sizes from $\frac{1}{2}$ cu. yd. up



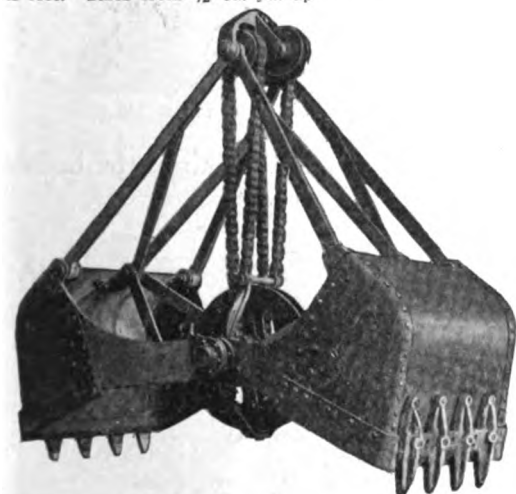
No. A-1599. HAYWARD SCRAPER CLAM SHELL BUCKET

Recommended for handling iron ore, pumped sand and other densely packed and heavy materials. Fills with but little material under the bucket, gathering its load by a combined digging and scraping movement. Sizes from $2\frac{1}{2}$ cu. yds. up



No. A-2377. HAYWARD ELEC-
TRIC MOTOR CLAM SHELL
BUCKET WITH ORE BOWL

Can be hung on a crane or any hoisting apparatus. Bowls are electrically operated with self-contained mechanism. Works within its own height. Digging and discharge under control at every stage. Sizes from $7\frac{1}{2}$ cu. ft. up, with A.C. or D.C. motors



No. A-1340. TEETH FOR HAYWARD CLAM SHELL
BUCKETS

Made of steel. Recommended for handling some materials in their natural state. Can be attached to all styles and sizes of Hayward clam shell buckets with ore bowls



No. A-1232. HAYWARD DRAG SCRAPER BUCKET

May be operated on almost every type of machine with double drum engine. Can be adjusted to enter material at any angle—and has no rigid bale or bridle in the bucket, hence nothing to break if it lands on side or top. Sizes from $\frac{1}{4}$ cu. yd. up

THE GEORGE HAISS MFG. CO., INC.

Contractors' and Coal Dealers' Excavating and Rehandling Machinery

Canal Place and East 141st Street
NEW YORK, N. Y.

TELEPHONE
MOTT HAVEN 0157

CABLE ADDRESS
"COAL-HOIST, NEW YORK"

Products

GRAB BUCKETS and COUNTERWEIGHT HOLDING DRUMS.

A line of Contractors' and Coal Dealers' and Material Handler's Machinery including Floating, Portable and Tower Cranes; Steam and Electric Hoists; Mast and Gaff Hoist Fittings and Sheaves; Coal and Ore Hoisting Engines; Coal Car Cable Hauling Engines; Automatic Dumping Coal Cars; Coal and Ash Bins; Coal and Sand Cut-off Valves; Coal and Ash Gates and Chutes; Revolving and Shaker Screens; Tying Machines; Unloading Towers; Industrial Railways.

For Loaders, Unloaders, Elevators and Belt Conveyors, see pages 820-821.

Haiss Type "Contractor" Grab Buckets

Uses—Haiss type "Contractor" grab buckets are used for automatic digging from sand and gravel banks, crushed stone piles, and for unloading hard and soft coal, coke, sand, stone, ore, chemicals, etc., from boats and railroad cars. They are also employed for excavating and dredging canals, making railroad embankments and dams, and for other purposes when labor and time can be reduced in construction work.

Advantages—In the first place, a Haiss "Contractor" grab bucket digs, loads and discharges mechanically; and in the second place, being attached to any type of derrick or crane, the load of material which it has dug may be raised from almost any depth to any reasonable height, and swung or carried to a near or distant point before discharging its load. Under usual

HAISS
TRADE-MARK

working conditions most hoisting installations are capable of making two trips per minute; and since these buckets are built in capacities from $\frac{1}{4}$ cu. yd. to 3 cu. yds., it is easily calculable what amount of material per day the Haiss "Contractor" grab bucket can handle.

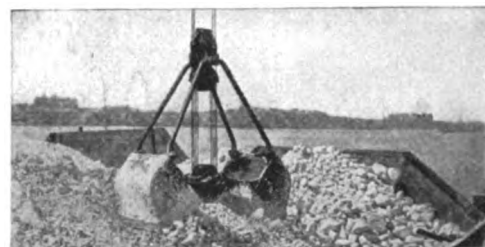
Two hoisting cables control the bucket operations.

Description—All Haiss grab buckets are constructed of heavy plate steel and steel castings. In the "Contractor" bucket, shown here, steel flat-link side chains are used. By tolling up on the hubs of the large closing wheel, these chains provide a 1:4 closing power ratio. The "High-Power" grab bucket (also shown), however, depends on the "block and fall" principle of cable reeving for drawing the two halves of the bowl together. A 1:7 closing power is thus obtained, and gives this particular bucket a powerful penetrating effect. Teeth can be bolted to the jaws of all Haiss buckets.

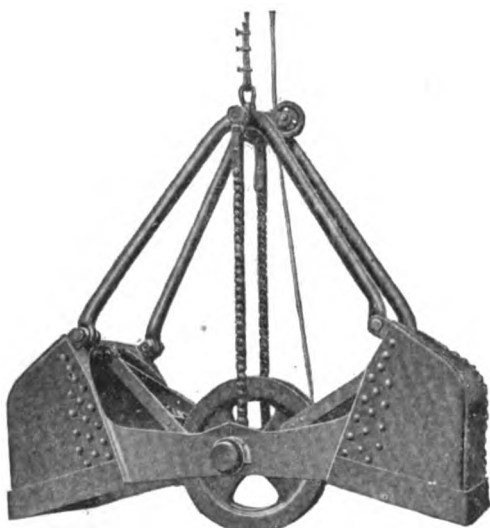
The Haiss "High-Power" grab bucket should be used for hard digging, such as clay, ore, and heavy earth excavation when made either above or under water.



HAISS "CONTRACTOR" BUCKET DIGGING IN A SAND PIT



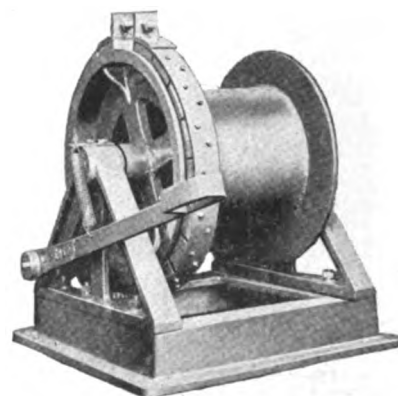
HAISS "HIGH-POWER" BUCKET FOR HARD DIGGING



HAISS TYPE "CONTRACTOR" GRAB BUCKET
OVER-ALL DIMENSIONS AND WEIGHTS

Capacity, cu. yds.	Weight, lbs.	Closed		Width, ft. in.	Open	
		Height, ft. in.	Length, ft. in.		Height, ft. in.	Length, ft. in.
$\frac{1}{4}$	1200	4 5	3 8	2 6	5 1	5 1
$\frac{1}{2}$	2100	5 2	4 3	3 2	5 11	6 1
$\frac{3}{4}$	2400	5 4	4 9	3 2	5 4	6 5
1	2800	5 11	5 1	3 5	6 10	7 3
$1\frac{1}{4}$	3300	6 3	5 6	3 10	7 4	7 7
$1\frac{1}{2}$	4000	7 2	6 5	3 10	8 4	9 0
$1\frac{3}{4}$	4250	7 2	6 5	4 2	8 5	9 0
2	5000	7 2	6 5	4 8	8 5	9 0

Holding Drum—This drum controls the holding cable fastened to the top of the grab bucket. It takes the place of an extra drum on a hoisting engine and takes up automatically by means of a counterweight the slack in the holding cable when the closing cable is hoisting the loaded bucket. Full explanation for rigging this drum free on application.



COUNTERWEIGHT HOLDING DRUM

LAKEWOOD ENGINEERING COMPANY

Clamshell Buckets

CLEVELAND, OHIO

DISTRICT OFFICES

ATLANTA, GA., 90½ North Forsythe Street
BALTIMORE, MD., American Building
BOSTON, MASS., 453 Washington Street
BUFFALO, N. Y., 256 Main Street
CHICAGO, ILL., Lumber Exchange Building
CLEVELAND, OHIO, Racine Building
DALLAS, TEX., Sumpter Building

DETROIT, MICH., David Whitney Building
KANSAS CITY, MO., Railway Exchange Building
NEW YORK, N. Y., 141 Centre Street
PHILADELPHIA, PA., Widener Building
PITTSBURGH, PA., Union Arcade
ST. LOUIS, MO., Railway Exchange Building
SAN FRANCISCO, CAL., Rialto Building

Products

CLAMSHELL BUCKETS.

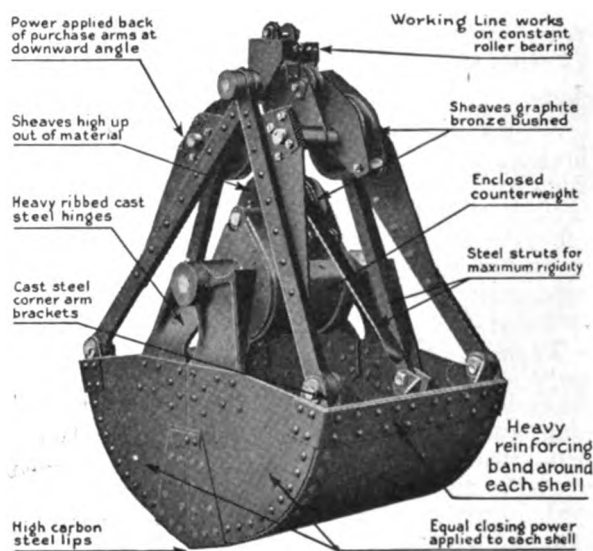
For Industrial Locomotives, see page 890; for Industrial Railway Equipment, see page 896; for Industrial Tractors and Trucks, see page 899.

Clamshell Buckets

Lakewood clamshell buckets are designed and built to get full loads every time, and they do it. The closing power increases as the shells come together. The Lakewood clamshell digs down as it closes, gets all it can hold and comes up filled to overflowing. Short cable overhaul speeds operation of bucket. Weight of counterweight can be adjusted to suit material handled. Upper sheaves on the closing arms give maximum digging force.

Speed in handling sand, stone, gravel, coal and other loose material has made the Lakewood clamshell popular for this work.

Lakewood handler buckets are built in sizes ¼, ¾, 1 and 1½ yds. Lakewood diggers are built in sizes ¾, 1, 1½, 2 and 2½ yds.



LAKEWOOD CLAMSHELL BUCKET

LAKEWOOD DIGGERS

Type 640

For doing heavy work—digging, excavating, dredging and moving some of the heavier, lumpy materials

Type	Capacity	Weight	Average load	Water level	Thickness of shells	Size of cutting edges	Diameter of sheaves
640-B	¾ yd.	2750 lbs.	22 cu. ft.	13 cu. ft.	¾ in. plate	¾ in. x 10 in. wide	10 in.
640-C	1 yd.	3830 lbs.	32 cu. ft.	19 cu. ft.	¾ in. plate	¾ in. x 10 in. wide	12 in.
640-CX	1 yd.	4300 lbs.	32 cu. ft.	19 cu. ft.	¾ in. plate	¾ in. x 10 in. wide	12 in.
640-D	1½ yd.	4500 lbs.	42 cu. ft.	27 cu. ft.	¾ in. plate	¾ in. x 10 in. wide	12 in.
640-E	2 yd.	6125 lbs.	59 cu. ft.	41 cu. ft.	¾ in. plate	¾ in. x 10 in. wide	14 in.
640-F	2½ yd.	7100 lbs.	74 cu. ft.	54 cu. ft.	¾ in. plate	¾ in. x 10 in. wide	14 in.

LAKEWOOD HANDLERS

Type 641

For handling loose material like coal, sand, gravel, crushed stone, slag, cinders and other substances of like character

Type	Capacity	Weight	Average load	Water level	Thickness of shells	Size of cutting edges	Diameter of sheaves
641-A	½ yd.	2170 lbs.	15 cu. ft.	10 cu. ft.	¾ in. plate	¾ in. x 10 in. wide	10 in.
641-B	¾ yd.	2530 lbs.	22 cu. ft.	13 cu. ft.	¾ in. plate	¾ in. x 10 in. wide	10 in.
641-C	1 yd.	3350 lbs.	32 cu. ft.	19 cu. ft.	¾ in. plate	¾ in. x 10 in. wide	12 in.
641-D	1½ yd.	3900 lbs.	40 cu. ft.	27 cu. ft.	¾ in. plate	¾ in. x 10 in. wide	12 in.
641-DS		4550 lbs.	1½ yd. oversize		¾ in. plate	¾ in. x 8 in. wide	14 in.

ORTON & STEINBRENNER CO.

Manufacturers of Buckets and Coal Crushers

608 South Dearborn Street
CHICAGO, ILL.

For List of Sales Representatives, see page 30

Products

CLAMSHELL, ORANGE PEEL, DRAGLINE and SCRAPER TYPE BUCKETS; COAL CRUSHERS.

For Locomotive Road Wheel and Crawling Tread Cranes see pages 30-31.

Catalogues

Completely illustrated and descriptive catalogues of the following equipment will be mailed on request:

Catalogue No. 17. Clamshell, Orange Peel and Scraper Buckets.

Catalogue No. 19. Coal Crushers.

Buckets

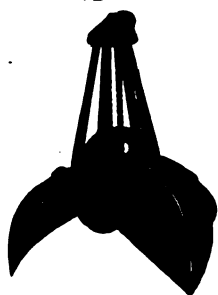
We manufacture several different styles or types of buckets. Each type is designed especially for a particular class of work. Each is constructed in the main of structural and cast steel and all sheaves are bronze bushed. Adequate provision is made for lubrication by means of patented pressure system of greasing.

Type "V" Clamshell—The Type V is of the multiple sheave type and has normally 6-part closing action for hard digging. When rehandling coal or sand one of the sheaves may be removed, thus speeding up the action. Standard sizes range from $\frac{1}{2}$ to 5 cu. yds. capacity.



TYPE "V" CLAMSHELL BUCKET

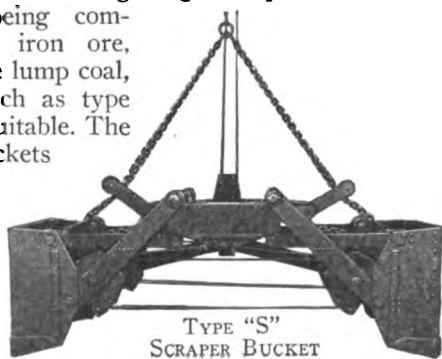
Type "P" Orange Peel—For exceptionally hard digging, such as clay or compacted sand, the orange peel type of bucket illustrated is generally used. This bucket has a powerful bull wheel operated by flexible chain and cam. Scoops are of cast steel and are protected by manganese steel points. Standard sizes range from $\frac{1}{4}$ to 5 cu. yds. capacity.



TYPE "P" ORANGE PEEL BUCKET

Type "S" Scraper—When handling large lump material not

susceptible to being compacted, such as iron ore, quarry rock, large lump coal, etc., a bucket such as type "S" is the most suitable. The ends of these buckets are left open to allow for overflowing of material. Standard sizes range from $\frac{3}{4}$ to 10 cu. yds. capacity.



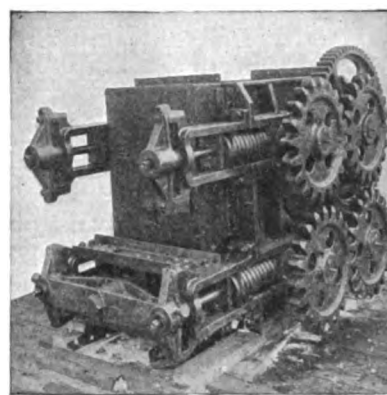
TYPE "S" SCRAPER BUCKET

APPROXIMATE WEIGHTS OF STANDARD BUCKETS, POUNDS

Size, cu. yds. . . .	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	4	5	$7\frac{1}{2}$	10
Type V Clamshell, lbs.	2000	2300	2800	3200	3900	4300	6300	7100	8500	12400	.....	.....	.....
Type P Orange Peel, lbs.	1500	2500	3600	4800	5600	7200	9500	10500	12000	15000	19000	.....	.....
Type S Scraper, lbs. . . . .	.....	.....	2700	3400	.....	4200	4600	6200	7100	9000	10900	15200	18400

Coal Crushers

"O. S. Dependable" coal crushers have been developed and perfected to such a degree that we are able to guarantee the uniformity of their output. They are manufactured in several sizes in either the 2-roll or 4-roll type. Capacities may be obtained up to 300



END VIEW OF 4-ROLL CRUSHER

tons per hour. Coal in sizes up to 24-in. lumps may be crushed down to $\frac{3}{4}$ -in. cubes, or size of coal may be changed by screw adjustment. They operate at slow speed, thereby cracking rather than breaking the coal and producing less fine dust.

Construction—Crusher segments are of high carbon or manganese steel and are lockbolted on cast steel spider frames. Spiders are keyed on heavy forged shafting supported by rigid side frames. All bearings are bronze bushed and split. They are practically dustproof, and provision is made for ample lubrication by means of patented pressure system of lubrication. Ends of crusher and motor are enclosed in dustproof casings and all gears are completely guarded.

Mechanical Features—Frequently coupling pins or other refractory foreign substances become accidentally engaged in the crusher rolls. To allow for this a pair of heavy coil springs are employed on the ends of one roll shaft enabling the rolls to spread apart a reasonable distance, but should the compression in the springs be insufficient to take care of an unusually large object, an equalizing device confines the breakage to a single bolt. A by-pass arrangement whereby slack coal can run through the crusher without operating is also provided.

Inquiries should state size of coal handled, capacity in tons per hour, fineness desired, and whether a traveling or stationary crusher is required.

G. L. STUEBNER

Manufacturer of Hoisting Buckets, Dump Cars and Melting Furnaces for
Contractors' Service

TELEPHONE
HUNTER'S POINT 0059

201-221 Vernon Avenue
LONG ISLAND CITY, N. Y.

Products

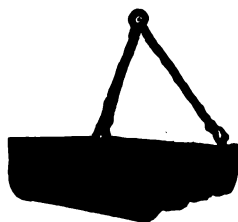
TURNOVER and BOTTOM DISCHARGE BUCKETS;
STEEL SKIPS; SMALL PLATFORM, END, SIDE and BOT-
TOM DUMP CARS.

PUSH CARTS, ASPHALT MELTERS, PIPE LINE LEAD
MELTING FURNACES, etc.

Standard Self-dumping and Self-righting Contractors' Buckets

Made in classes "A" and "B." Designed for use
with stone, sand, clay, concrete, etc.

Class "A"—Top of bucket
is from 8 to 10 in. wider
than the bottom, permitting
the bucket to be quickly
filled and rapidly dumped in a
clean manner. Easily handled
and well adapted for sinking
shafts, sewer work and similar
operations.



STEEL SKIP



"Invincible"
Bottom Dump
(Patented)



Self-dumping
and Self-righting
Turnover Type



"Excelsior" Bottom
Dump
(Patented)



"Pin-controllable"
Central Discharge
Pier Bucket
(Patented)



"Controllable"
Central Discharge
(Patented)



Two-line Bottom
Dump
(Patented)



Round Type



Side- and Back-lever Catch for Coal Hoisting



STUEBNER HOISTING BUCKETS

Class "B"—Similar to class "A," except that the
sides are straight, of equal width at top and bottom.
This bucket is nicely balanced, has double bottom,
strong bail, trunnions, reliable latch; also, weighs and
costs less than class "A." See illustrations of various
types of buckets made by G. L. STUEBNER.

"Controllable" Central Discharge Bucket—Used
for depositing concrete into smallest as well as largest
forms. Provided with patent pin-controlling device,
to regulate width of discharge opening; and with pow-
erful levers for controlling quantity of concrete run-
ning out.

**"Excelsior" and "Invincible" Bottom Dump
Buckets**—Particularly adapted to handle concrete, mud,
clay, sand, rock, etc. Quick acting, clean dumping, and
labor saving buckets.

Dump Cars, Push Carts and Melting Furnaces

Strongly
built of best
materials, in
various types
and sizes, for
severe service.
See illustra-
tions.



End Dump



Side Dump

DUMP CARS



PUSH CARTS



BOILER ROOM
CHARGING
WAGON



STATIONARY
LEAD MELTING
FURNACE



PORTABLE TAR MELTING BOILERS



STATIONARY
TAR MELTING
FURNACE

Capacities, Dimensions and Prices
Quoted on application.

Catalogue

Write for catalogue and further information.

KEYSTONE DRILLER CO.

Manufacturers of Well Drills and Deep Well Pumps

MAIN OFFICE AND FACTORIES
BEAVER FALLS, PA.

NEW YORK, N. Y., 170 Broadway

BRANCH OFFICES
JOPLIN, MO.

CHICAGO, ILL., Monadnock Building

Products

PORTABLE and TRACTION WELL DRILLING MACHINES for Water Wells, Artesian and Non-flowing; Mineral Prospecting for lead, zinc, copper, coal, fire clay, etc.; Placer Gold Testing in advance of dredging operations; Blast Hole Boring in cement and limestone quarries and heavy excavations; Deep Wells for petroleum or natural gas.

For "Downie" Deep Well and Centrifugal Pumps, see page 633.



gas or electric motor if required. Sills, beams and derricks are of seasoned fir. Boilers are A. S. M. E. code.

Non-tractions, to be hauled with horses, made in sizes No. 1 to 5½. These machines are of the double beam type and excel in "spudding" or shallow drilling.

Portable oil rigs, with improved friction tool hoist, sizes No. 27 and No. 32, are offered for deep wells. Have steel sills, babbitted bearings, mounted oil country (locomotive type) boilers on separate truck. Strongest and most efficient construction, maximum portability.

Keystone Drills

The Keystone traction, self-moving, well drills are made in sizes No. 3 to No. 5½.

They are complete, self-contained with motive power on one truck; generally furnished with vertical fire tube boiler and steam engine, but can be equipped with



PORTABLE DEEP WELL RIG
Sizes No. 27, No. 32 and No. 35

Applications

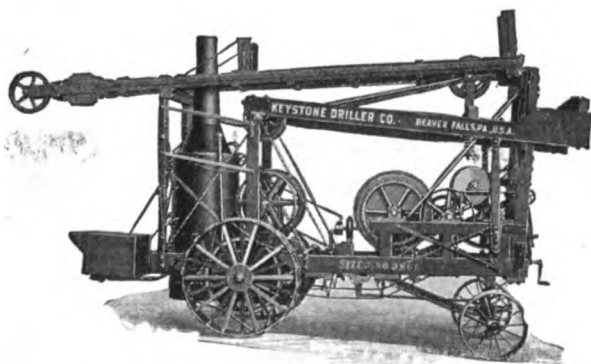
For Water Well Contracting—Farm and residential supply, where the depth ranges from 100 ft. to 200 ft. of 6-in. or 8-in. hole, the No. 3 Traction, cog hoist with steam engine (500-ft. machine) is commonly used. In rough country, the lighter No. 3 Non-traction style, drawn by four or six horses or oxen, may be preferable. When fuel and water are scarce the No. 3 or No. 4 Non-traction with gas-motor is advised. For very deep water-wells, 1,000 ft. to 3,000 ft. in depth, use the heavy portable oil rigs, sizes No. 27 and No. 32.

For Oil and Gas Wells—Sizes No. 27, No. 32 and No. 35 with mounted Oil Country Boiler on separate truck.

For Blast Holes—In limestone and cement quarries, heavy excavation, etc., No. 3½ Traction or Non-traction, steam or electric driven, because of its long rapid stroke.

For Mineral Prospecting—For lead, zinc, copper, coal, etc., the No. 3, No. 3½, No. 4 or No. 5½ Traction steam drill is generally used.

For Placer Gold Testing in Advance of Dredging—The No. 3 Traction or Non-traction, friction-hoist steam drills are employed to drive a 6-in. heavy pipe, with cutting shoe, to bed rock, the gold bearing content of the pipe being removed with a vacuum sand pump.



TRACTION STEAM WELL DRILL
Sizes No. 1 to 5½

PRINCIPAL SIZES AND STYLES OF KEYSTONE WELL DRILLS

Size No.	Style	Tool hoist	Power	Size boiler	H. p. of motor or engine	Depth capacity, ft.	Shipping weight with tools, lbs.	Principal uses
1	Non-traction	Friction	Steam	30"x60"	6	250	9000	Shallow water wells, test holes
3	Non-traction	Cog	Steam	34"x66"	8	500	11000	Water wells, test and blast holes
3	Traction	Cog	Steam	34"x66"	11	500	14000	Water wells, test holes, blast holes
3	Traction	Friction	Steam	34"x66"	11	350	14000	Placer gold testing, water wells, blast holes
3½	Non-traction	Cog	Gas motor	34"x66"	12	400	11000	Blast holes, water wells, test holes
3½	Traction	Cog	Steam	34"x66"	11	400	14000	Blast holes, water wells, test holes
3½	Traction	Cog	Electric	34"x66"	15	400	12000	Blast holes, water wells, test holes
4	Non-traction	Cog	Steam	34"x66"	11	800	12000	Water wells, shallow oil wells, test holes
4	Traction	Cog	Steam	34"x66"	11	800	15000	Water wells, shallow oil wells, test holes
4½	Traction	Cog	Gas motor	40"x72"	18	800	14000	Water wells, test holes, blast holes
5	Non-traction	Cog	Steam	40"x72"	14	1000	15000	Water wells
5	Non-traction	Cog	Gas motor	40"x72"	18	1000	15000	Water wells
5	Traction	Cog	Steam	40"x72"	14	1000	18000	Water wells, shallow oil wells
5½	Traction	Comb.	Steam	40"x72"	14	1000	18000	Special water wells, mineral test holes
27	Non-traction	Friction	Steam	25 h.p.	30	2500	26000	Oil wells, separate boiler—25 h.p., mounted
32	Non-traction	Friction	Steam	25 h.p.	30	3000	28000	Oil wells, separate boiler—30 h.p., mounted.
35	Non-traction	Friction	Steam	30 h.p.	45	3500	32000	Oil wells, separate boiler—30 h.p., mounted.

Traction Excavator

The Keystone Traction Excavator is a comparatively light, exceptionally portable steam shovel for contractors' general use. Two sizes, Models 3 and 4. Either can be equipped with electric motor for use in buildings or mines.

It is highly versatile but has all the efficiency of specialized design, being equally usable with three interchangeable buckets—skimmer, ditcher and clamshell—for road and street grading, heavy cutting, trenching, back-filling, cellar-digging, pit-mining, loading and unloading and handling materials. Its long horizontal crowd—14 ft.—and powerful crowding thrust give it pre-eminence in the street-repairing and shallow cutting

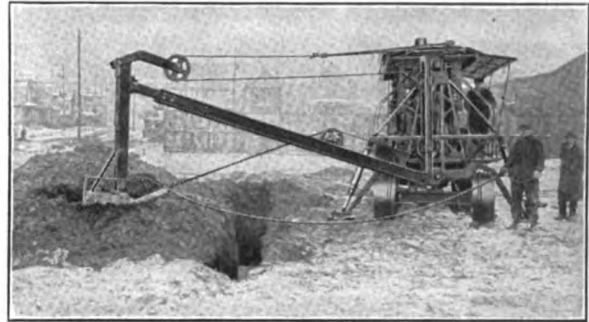
field. Will dig old paving blocks, macadam, asphalt or blasted concrete.

Model 3 weighs 10 tons, has 16-ft. boom, 36x69 boiler, 18 h.p. single engine and operates a ½-yd. skimmer or clam and full range of ditcher buckets.

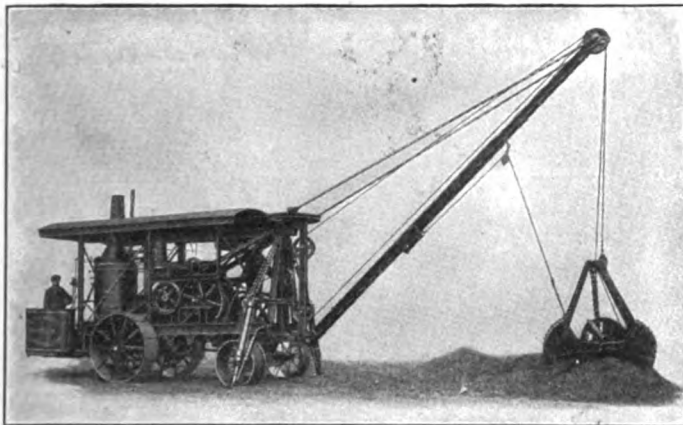
Model 4 weighs 14 tons, has 18-ft. boom, 40x72 boiler, 32 h.p. double 6x6 engine, hydraulic side jacks. Operates heavy ⅝-yd. skimmer bucket, ½-yd. clam and regular range of ditcher buckets, 14 to 36 in. wide.



BACK FILLING



MODEL 3. 10-TON EXCAVATOR DIGGING CELLAR

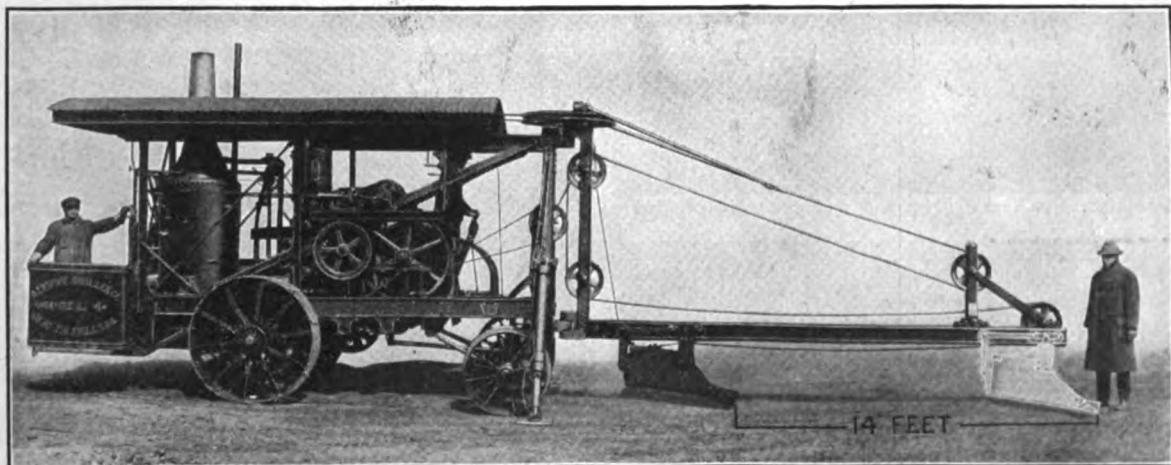


MODEL 4. EQUIPPED WITH ½-YD. CLAMSHELL BUCKET, AS USED FOR UNLOADING FREIGHT CARS



MODEL 4. 14-TON MACHINE WITH IMPROVED DROP-BOTTOM DITCHER BUCKET, DUMPING INTO TRUCK

It stands on the solid and cuts any width or depth to 20 ft.



MODEL 4. 14-TON ALL STEEL EXCAVATOR WITH ⅝-YD. SKIMMER BUCKET

SAUERMAN BROS.

Cableway Excavators, Power Scrapers and Fittings

TELEPHONE
HARRISON 3181-2-3

1145 Monadnock Building
CHICAGO, ILL.

CABLE ADDRESS
CABEX

Products.

Manufacturers of CABLEWAY EXCAVATORS, POWER SCRAPERS (Patented).

Also Cableway Fittings.

Sauerman Dragline Cableway Excavators

Uses—The following is a partial list of the classes of work for which Sauerman dragline cableway excavators have been installed:

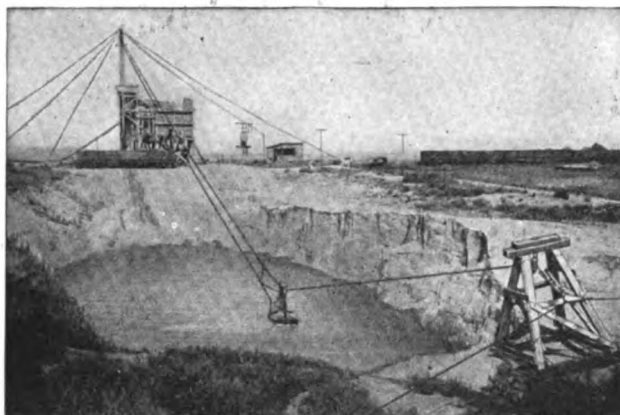
Excavating sand and gravel from under water and from dry pits; loading ballast to cars; reclaiming coal from storage; deepening rivers; building levees; stripping clay beds; removing sand bars from rivers; reservoir construction and cleaning; placer mining.

Advantages—Sauerman dragline cableway excavators will dig, elevate, convey the material over a span of 700 ft. or more and will dump the material at any point.

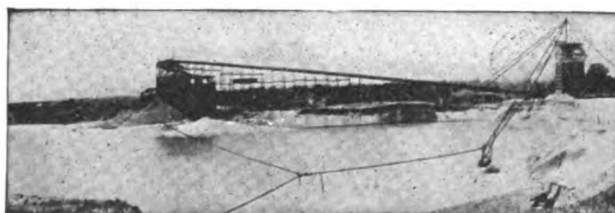
These excavators are operated entirely by one man and dig equally as well under water as in dry material. As the initial investment required is not large and cost to operate and maintain is also low, this type of equipment appeals to the man who is of an economical turn of mind.



SPECIAL SAUERMAN CABLEWAY USED TO BUILD LEVEES



TYPICAL GRAVEL PIT OPERATION WITH SAUERMAN CABLEWAY



SAUERMAN CABLEWAY AT 2000-TON PER DAY GRAVEL PLANT

Bottomless Power Scrapers

Uses—Sauerman power scraper systems are especially designed for digging and conveying materials short distances. For excavating bank deposits of gravel, storing and reclaiming coal and other loose materials, stripping overburden, digging clay, making highway cuts and fills, our scrapers are economical because they possess large capacity, yet require no great outlay to install, operate and maintain.

Operation—Operated by a double drum friction hoist which pulls the scraper back and forth over the material. Being bottomless, the scraper deposits its load automatically when the operator puts the pull-back cable in operation.

Catalogues

Booklets containing data, photographs and diagrams free on request.



FOUR TYPES OF SAUERMAN POWER SCRAPERS HANDLING (1) GRAVEL, (2) COAL (3) TOP SOIL, (4) LOOSE SAND

LIDGERWOOD MANUFACTURING CO.

Hoisting and Hauling Machinery

MAIN OFFICES

Liberty and Church Streets
NEW YORK, N. Y.

BRANCH OFFICES

CHICAGO, ILL.

PITTSBURGH, PA.

PHILADELPHIA, PA.

SEATTLE, WASH.

LONDON, ENGLAND

Products

STEAM, ELECTRIC and GASOLINE HOISTS for contractor's work, derrick work, grab bucket work, shafts, coal and freight handling, mines, quarries, dredges and excavators; CABLEWAYS and CABLEWAY EXCAVATORS.

Also manufacturers of Steel and Wood Derricks and Derrick Fittings, Ballast Unloaders, Ship and Dock Winches, Steering Engines, Towing Engines, Logging Machinery.

Experience

Since 1873 this company has devoted itself exclusively to the manufacture of hoisting and hauling machinery, and the Lidgerwood machinery of today embodies every improvement in design and construction suggested by this long experience.

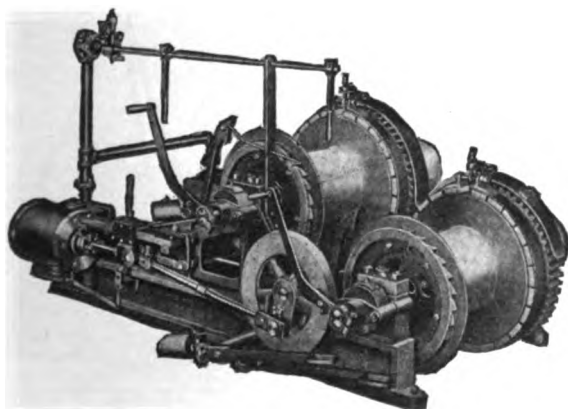
This company equips each electric hoist with the type of motor best adapted for the work to be done by the hoist and is prepared to equip both electric and steam hoists with the latest type of automatic control and safety devices.

Lidgerwood Hoists

It is the practice of the LIDGERWOOD MANUFACTURING Co. to design the complete machine to operate under the maximum service it is built to perform, and to build every part of the machine to meet the strain of working at its full capacity.

Drums are built of the friction, clutch and fixed types. The friction drums, both cone and band type, have the patented cork inserted friction woods, which greatly increase their holding capacity.

Two types of contractors' hoists are shown: a double drum steam hoist, without boiler for derrick work, and an electric hoist for 3-line derrick operating

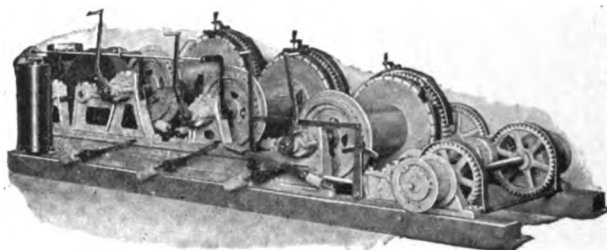


DOUBLE FRICTION DRUM, DOUBLE CYLINDER STEAM HOIST WITHOUT BOILER

a grab bucket, the hoist having 3 drums and the Lidgerwood patented swinging gear for operating the bull wheel that swings the derrick.

The steam, electric and gasoline hoists are built in single, double, and triple drum types—the double and triple drum hoists can be fitted with the boom swinging gear. Steam hoists are built in all styles both with and without boilers. Electrical hoists are fitted with either direct or alternating current motors. The company has standard hoists built for every ordinary hoisting service required in contracting, building, industrial plants, mast and gaff rigs, warehouse and dock work, pile driving, derrick work, operating grab buckets, excavating and dredging, mining and quarrying.

In addition to the standard sizes and styles, the LIDGERWOOD MANUFACTURING Co. is equipped to build steam hoists of special types up to 1000 h.p. and electric hoists in any size for all hoisting work.



THREE-FRICTION DRUM, ELECTRIC HOIST WITH BOOM SWINGING GEAR

In requesting estimate, state what power is to be used—if steam, whether boiler is to be supplied with the hoist; if not, what steam pressure is available at throttle; if electric, give voltage if direct current, and voltage, cycle and phase if alternating. State either the maximum rope pull on single line, or, if block and tackle be used, give maximum load and number of parts of rope to be used, giving a general description of the work to be done.

Lidgerwood Cableways

Lidgerwood cableway is a hoisting and conveying machine, capable of carrying single loads up to 30 tons over spans of 2000 ft. without intervening supports. They have stationary or traveling towers. They handle loads in slings, plain or automatic dumping skips, and operate clamshell, orange peel, or scraper buckets for excavating.

Cableways are valuable in constructing dams, bridges, filtration beds, and for open pit mining, quarrying, and excavating over wide areas.

CONTINENTAL BRIDGE CO.

Steel Derricks and Cranes

CABLE ADDRESS
"CONBRIDGE"

Monadnock Block
CHICAGO, ILL.
PLANT, PEOTONE, ILL.

Western Union and Bentley Code

Products and Services

All types of STEEL DERRICKS built to order, in any capacity, designed to fit your requirements.

ALL-STEEL DERRICK CARS built to order, complete, for steel erection and other purposes; STEEL DERRICK SKIPS; HAND POWER BAR CUTTERS.

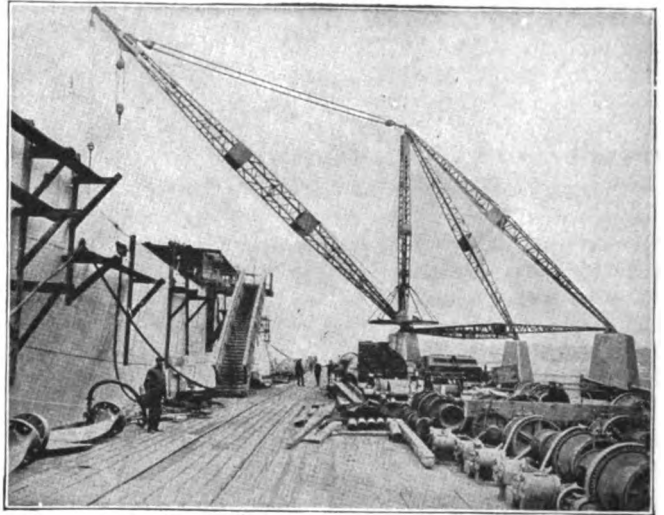
Also All-steel Industrial Cars for every purpose, Jib Cranes, Hand Power Traveling Cranes, Graves Steel Trusses.

Fabricators of Steel Buildings, Bridges, and Special Construction.

Continental Steel Derricks

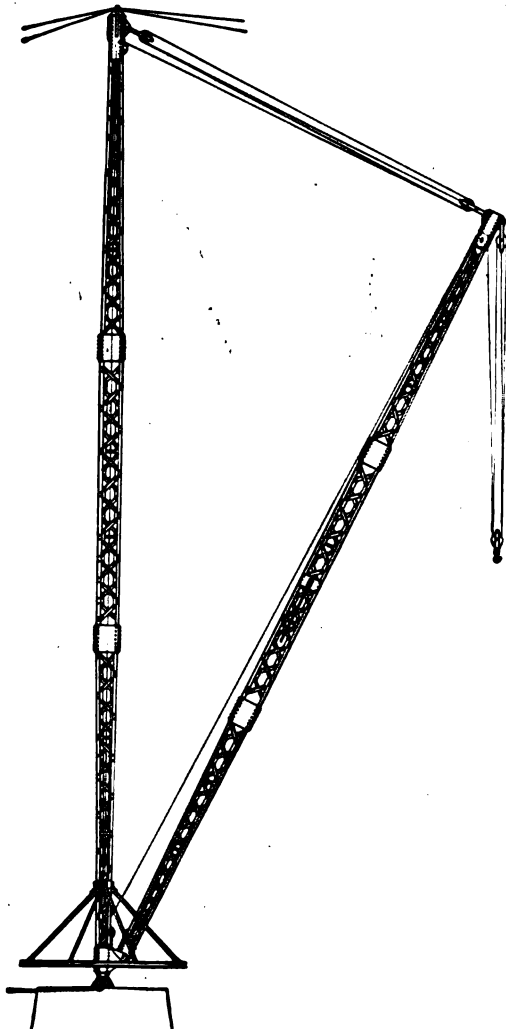
Derricks are all-steel of latticed angle construction with angle lacings. Complete derrick includes mast, boom, stiff legs, stiff leg anchor shoes, all castings, straps, sheaves, blocks, bull wheel and guide sheaves.

Sheaves are grooved for wire rope and fitted with self-lubricating bronze bushings unless otherwise ordered.

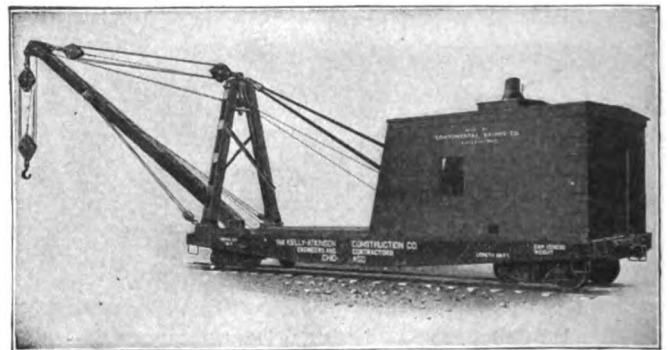


STIFF LEG DERRICK

Built for Newburgh Shipyard, Inc., fitting out dock, Newburgh, N. Y.



GUY DERRICK



ALL-STEEL DERRICK CAR

Built for Kelly-Atkinson Construction Co., steel erectors, Chicago, Ill.

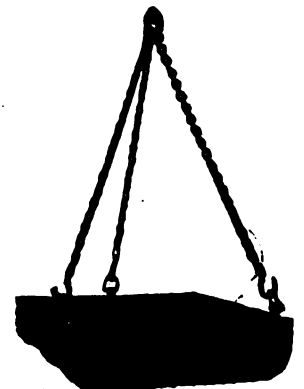


HAND POWER BAR CUTTER

Cuts deformed reinforcing bars up to 1 1/4 in.

Engineering Service

Our Engineers are always ready to help solve derrick problems without any obligation on your part.



DERRICK SKIP

Built for U. S. Government
Muscle Shoal Dam, Florence, Ala.

TERRY MANUFACTURING CO.

Derricks and Cranes

Grand Central Terminal
NEW YORK, N. Y.

PLANT, KEARNY, N. J.

Products

STEEL and TIMBER STIFF LEG, GUY and BARGE DERRICKS and JINNIWINKS.

HINGED BOOM REVOLVING and TRAVELING TOWER and HEAVY DUTY PEDESTAL CRANES.

Terry Derricks

Used extensively for 23 years in industrial plants, quarries, lumber yards, and for handling of stone, coal and all other bulk materials; also in the erection of steel structures.

Terry Barge Derricks are built for general wrecking or lighterage work.

Cranes are for use in cement plants, shipyards, dry docks and industrial plants. These cranes have booms up to 110 ft. long and will handle up to a 4-yd. bucket.

Terry Derrick Fittings

All Terry Derricks, Travelers and Jinniwalks are pin connected, permitting inexpensive and speedy dismantling or erection. All goosenecks are forged from soft steel billets. The mast step and foot block is a highly finished ball and socket joint with a simple yet effective oiling system. The mast head unit on the stiff leg derricks is self-contained and attached by bolts, the gudgeon pin and lead sheaves being carried therein.

Terry Timber Derricks are carried in stock, and are sold with or without timbers.

Service

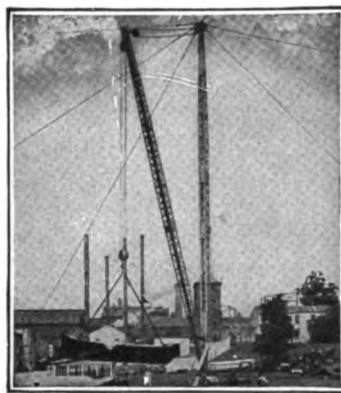
This company maintains a development department for solving material handling problems. Inquiries should contain full information to enable us to quote.



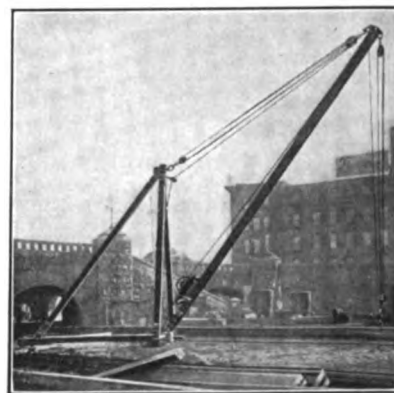
"A" FRAME BARGE DERRICK
5- to 150-ton capacity



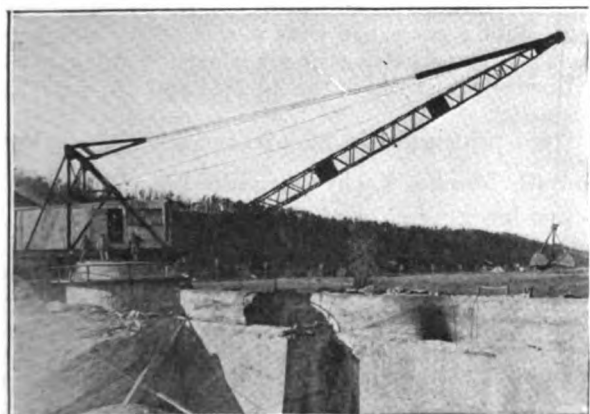
5-TON SELF-SLEWING DERRICK



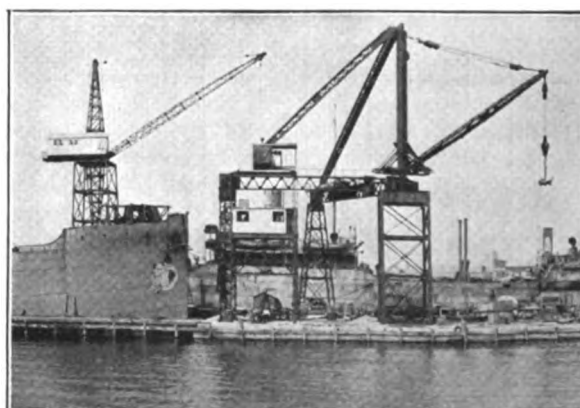
GUY DERRICK
5 to 30 tons



JINNIWALK DERRICKS
2. 3. 5 and 6 tons



FULL CIRCLE DERRICK, MOUNTED ON CONCRETE BASE
Capacity up to 4-yd. bucket



HINGED BOOM TOWER CRANES AND STIFF LEG DERRICKS
Cranes up to 50 tons capacity; derricks to 150 tons

PLYMOUTH CORDAGE COMPANY

NORTH PLYMOUTH, MASS.

CANADIAN OFFICE: WELLAND, CANADA
DISTRIBUTING AGENCIES IN ALL LARGE CITIES

Products

MANILA, SISAL and HEMP CORDAGE, including both Rope and Binder Twine.

Dominant Features of Plymouth Manila Rope

Strength, durability, yardage, uniformity.

Absolutely pure Manila fiber properly blended for the work it is to do, correctly lubricated, uniformly spun and laid, is responsible for these outstanding characteristics.

While almost invariably exceeding all requirements of strength tests, Plymouth rope gives exceptional yardage (feet per pound) and wear. The careful selection of fibers going into the various types of Plymouth rope, together with exactness in manufacture, produce an exceptionally uniform product.

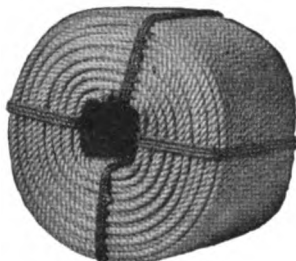
Plymouth Manila Rope, Three-strand

Recommended for all work not calling for goods of special construction, stock or lay. Furnished on all orders which specify simply "Manila" or "Manila Three-strand."

Made from Manila fiber of high quality. Has ample strength and durability for all general purposes.

Ordinarily used in right-laid and untarred forms, but can be furnished left-laid or tarred when desired.

The lay is our "regular" lay—soft enough for easy handling and splicing, yet firm enough to preserve the rope's shape.



THREE-STRAND MANILA ROPE

TABLE A—APPROXIMATE GROSS WEIGHT AND STRENGTH, COMMON LAY THREE-STRAND PLYMOUTH MANILA ROPE

Name, and size in circumference, in.	Approximate diameter, in.	Standard coil		Minimum tensile strength, lbs.	Length of rope in one pound, ft. in.
		Length, ft.	Weight, lbs.		
6 thd. 3/4	3/4	3,333	50	480	66 8
6 thd. 7/8	7/8	2,750	50	620	55
9 thd. 1	1	1,820	50	1,000	36 4
12 thd. 1 1/4	1 1/4	1,350	50	1,275	27
15 thd. 1 1/2	1 1/2	1,200	50	1,600	24
1 1/4	1 1/4	1,200	65	1,750	18 6
1 1/2	1 1/2	1,200	75	2,100	16
1 3/4	1 3/4	1,200	90	2,450	13 4
2	2	1,200	125	3,150	9 7
2 1/4	2 1/4	1,200	160	4,000	7 6
2 1/2	2 1/2	1,200	198	4,900	6 1
2 3/4	2 3/4	1,200	234	5,900	5 1
3	3	1,200	270	7,000	4 5
3 1/4	3 1/4	1,200	324	8,200	4 8
3 1/2	3 1/2	1,200	378	9,500	3 2
3 3/4	3 3/4	1,200	432	11,000	2 9
4	4	1,200	504	12,500	2 5
4 1/4	4 1/4	1,200	576	14,200	2 1
4 1/2	4 1/2	1,200	648	16,000	1 10
4 3/4	4 3/4	1,200	720	17,500	1 8
5	5	1,200	810	19,500	1 6
5 1/4	5 1/4	1,200	900	21,500	1 4
5 1/2	5 1/2	1,200	1,080	25,500	1 1
6	6	1,200	1,296	30,000	0 11
6 1/4	6 1/4	1,200	1,512	34,000	0 9 1/2
6 1/2	6 1/2	1,200	1,764	38,500	0 8
7	7	1,200	2,016	43,500	0 7
7 1/4	7 1/4	1,200	2,304	49,000	0 6 1/2
7 1/2	7 1/2	1,200	2,590	55,000	0 5 1/2
8	8	1,200	2,915	61,000	0 5
8 1/4	8 1/4	1,200	3,240	67,000	0 4 1/2
10	10	1,200	3,600	73,000	0 4

* Laboratory test, new manila rope.

Plymouth Manila Rope, Four-strand

Recommended for more common forms of sheave work as on running rigging, contracting equipment, painters' falls, haying rigs, etc.



Can be had with or without a heart rope. Made from Manila fiber of excellent quality.

Laid somewhat harder than the three-strand. Strands in contact with each other over larger area, more circular in contour. (See cross-sectional view.)

Wears rounder, runs more smoothly and lasts longer than three-strand on sheave work.

Difference in working strength, size for size, between three- and four-strand is not very marked, but four-strand is approximately 5% heavier in weight.

Standard length of coils: sizes 1 1/4 to 3 1/4 in. in circumference, inclusive, 1200 ft.; 3 1/2 in. in circumference and larger, 1150 ft.

Plymouth Manila Drilling Cable

The line to which the "tools" are attached in drilling oil, gas, water and mineral exploration wells. A hawser-laid product. Has the elasticity needed in drilling work. Made from fiber chosen particularly for its strength and toughness. Possesses unusual wearing quality.

Thoroughly treated with special lubricant to afford protection against heat, dirt and the action of water.

Laid uniformly and correctly.

Can be furnished in special lengths for wells of any depth, in any size from 1 1/4 to 2 1/2 in. in diameter.



MANILA DRILLING CABLE

Plymouth Manila Sand Line

For lowering and hoisting the "bailer" in removing the drillings from oil, gas, water and mineral exploration wells. A hawser-laid product, identical in lay and quality of fiber with our drilling cable.

Common sizes, 5/8 to 1 in. in diameter.

Can be furnished in special lengths for wells of any depth.

Plymouth Manila Bull Rope

Used as a driving rope for the bull wheel in oil well drilling outfits. A three-strand rope. Made from the same high quality of fiber as our regular three-strand Manila rope, but with a special lay which provides an extra good wearing surface.

Furnished usually in the 2-, 2 1/8- and 2 1/4-in. (diameter) sizes.

Used principally in 85-, 90- and 95-ft. lengths.

Plymouth Manila Yacht Torpedo Line

For lowering charges of explosives in shooting oil wells. Furnished either three-strand or four-strand as desired. Made from specially selected fiber. Is extraordinarily strong and dependable.

Is lightly tarred to make it resist the action of water more effectively.

Harder laid than regular three- and four-strand rope.

Most common size 1/4 in. in diameter.

Can be furnished in coils free from splice for wells of any depth.

Plymouth Manila Towline

For ocean, lake, canal, river and harbor towing. Plymouth Manila rope, three-strand, in different sizes as desired, usually from 5 in. in circumference upwards; put up, unless otherwise specified, in standard coils of 200 fathoms (1200 ft.) and half coils of 100 fathoms (600 ft.). Can be furnished in coils of 250 fathoms (1500 ft.) 12 in. in circumference and in correspondingly greater lengths in smaller sizes.

Plymouth Manila Steamboat Line

For docking and tying up steamboats and steamships. A three-strand rope. Made from same high quality of fiber as Plymouth Manila rope.

Is also furnished made from selected stock.

Laid medium soft to give it greater strength and greater ease in handling.

Furnished in various sizes as desired, usually from 5 in. in circumference upwards.

Put up in standard coils of 200 fathoms (1200 ft.) and half coils of 100 fathoms (600 ft.).

Plymouth Manila Wrecking Cable

For floating stranded vessels. A hawser-laid product with plenty of elasticity and minimum unlaying tendency, important requirements on this work. Made from selected fiber. Has extra strength and durability.

Size usually 15 in. in circumference.

Standard length coils of 200 fathoms (1200 ft.).

Plymouth Manila Best Fall

Recommended for severe hoisting work, such as coal, cargo, quarry and grain elevator falls, and for piledriver hammer lines and other construction rigging subjected to severe strains.

A four-strand rope with heart.

Made from selected fiber. Contains tallow treated yarns, both in each strand and throughout the heart. Therefore less susceptible to the action of water than ordinary Manila rope.

Laid much harder than our ordinary four-strand product. Shows extra firmness under lateral pressure, as when in wraps on engine drum.

Offers extra resistance to internal and external friction and averages approximately 5% stronger, size for size, than our regular Manila rope.

Furnished commonly in sizes from 2¼ to 6 in. in circumference. Put up in coils of any desired length up to 185 fathoms (1110 ft.).



MANILA BEST FALL

Plymouth Manila Transmission Rope

Designed especially for power transmission drives. Three-strand rope recommended in sizes up to 1 in. diameter because of splicing advantages; above 1 in., four-strand with heart. (This heart or core is a small three-strand rope made from special Italian hemp which is softer and more absorbent than Manila and which forms a suitable bed for the strands to rest on.)

Made from selected fiber, chosen particularly for its toughness. Contains, both in strands and heart, yarns treated with special lubricant, designed to reduce to a minimum internal friction of fibers from constant bending. Plenty of lubricant in center of rope where most needed.

Both three- and four-strand much harder laid than our regular three- and four-strand ropes respectively. Built to meet the very severe conditions of surface wear encountered in rope driving. Does not call for any surface dressing when drive is properly designed. Put up, unless otherwise specified, in coils of 1200 ft. Can be furnished in any length desired.



MANILA TRANSMISSION ROPE

Other Plymouth Manila Products

Manila general purpose rope or clotheslines, net rope, raft rope, tent rope, buoy line, halter rope, fishermen's cable, wheel rope, whale line, spunyarn, lariat rope, yacht rope, lobster twine, trawl line, hay rope, hide rope and bale rope.

Plymouth Sisal Ropes

For work permitting a lower priced cordage. Less flexible than Plymouth, 67% as strong, size for size. More easily affected by moisture. Answers for many uses. Made always in three-strand form, common lay. Same size coils as Plymouth Manila.

Special Sisal Products

Clotheslines, halter ropes, raft rope, tent rope, hay rope, hide rope, spunyarn, bull rope, lariat rope, lath-yarn, shingle yarn, binder twine.

Plymouth Hemp Rope

Recommended in special cases requiring soft rope, not susceptible to the action of water. Finished three- and four-strand (with or without heart), made from highest grade hemp. Tarred or untarred. Put up in coils of 130 fathoms (780 ft.).

Other Hemp Products

Hemp bolt rope, marline, houseline, roundline, hambroline, spunyarn, seizing, ratline, leadlines, net rope, purse line, lathyarn.

New Zealand Products

New Zealand rope, three-strand. A grade of rope between Plymouth Sisal and Plymouth Manila. Made from high grade New Zealand fiber.

Also New Zealand raft rope and bull rope.

Rope Splicing Service

Where desired, we can furnish to Plymouth transmission rope customers, the services of a splicing expert, competent to take charge of a rope drive installation or adjustment job, including all splicing, and to give personal instruction in splicing to the customer's men.

Towline and Switch Rope Splicing—We are prepared to make eye splices in towlines and switch ropes before shipping goods to customers.

Thimbles—For customers who wish thimbles spliced into towlines before shipment, we are prepared to do this work if thimbles will be furnished.

Our knowledge and experience, based on years of rope manufacture, are at the service of our customers when special ropes are required.

Charges for any of these services are reasonable.

AMERICAN STEEL & WIRE COMPANY

Manufacturers of Wire Rope

SALES OFFICES

CHICAGO, 208 South La Salle Street
 NEW YORK, 30 Church Street
 WORCESTER, 94 Grove Street
 BOSTON, 185 Franklin Street
 PHILADELPHIA, Widener Building
 PITTSBURGH, Frick Building
 BUFFALO, 337 Washington Street
 DETROIT, Foot of First Street
 CINCINNATI, Union Trust Building

CLEVELAND, Western Reserve Building
 BALTIMORE, 32 South Charles Street
 WILKES-BARRE, PA., Miners Bank Building
 ST. LOUIS, MO., Liberty Central Trust Co. Building
 ST. PAUL-MINNEAPOLIS, Pioneer Building, St. Paul
 KANSAS CITY, MO., 417 Grand Avenue
 OKLAHOMA CITY, First National Bank Building
 BIRMINGHAM, ALA., Brown-Marx Building
 DENVER, First National Bank Building

SALT LAKE CITY, Walker Bank Building

EXPORT REPRESENTATIVES, UNITED STATES STEEL PRODUCTS CO., 30 Church Street, New York

PACIFIC COAST REPRESENTATIVES, UNITED STATES STEEL PRODUCTS CO., San Francisco, Los Angeles, Portland, Seattle

Products

All kinds of WIRE ROPE in the following qualities: Iron, Crucible Cast Steel, Extra Strong Crucible Cast Steel, Plow Steel and Monitor Plow Steel or Tico Special; STEEL CABLES.

Also a full line of Wire Rope Fittings: Slings, Thimbles, Clips, Clamps, Sockets, Hooks, Turnbuckles, Shackles, Blocks, Sheaves, etc.

For Concrete Reinforcement, see page 80; for Electric Wires and Cables, see page 768.

Qualities of Wire Rope and Their Uses

Wire rope is made in the following 5 qualities:

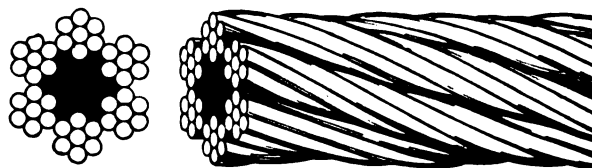
Iron Rope—The wires are made from the best quality iron, being soft, tough and flexible. They are of low tensile strength, approximately 85,000 lbs. per sq. in. Iron hoisting rope is most generally used for elevator hoisting, where the strength is sufficient. It is almost universally employed for counterweight ropes, except on traction elevators. For traction elevators this company recommends mild steel hoisting rope.

Crucible Cast Steel Rope—This is a medium strength material, tough and pliable, of moderate cost and general utility. Weighs only about half as much as iron for same strength; is harder, and better resists external wear. This rope is applicable to a great variety of uses, among which may be noted mine hoisting, logging, elevators, derricks, hay presses, dredges, cableways, inclined planes, coal hoists, conveyors, ballast unloaders, skip hoists and many other uses.

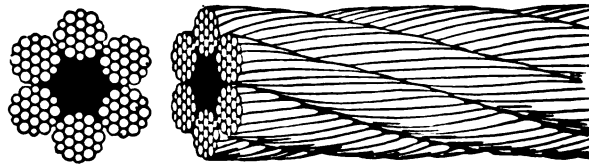
Extra Strong Crucible Cast Steel Rope—Of higher tensile strength than the crucible steel, and is tough, pliable, a little lighter for the same strength than crucible steel, and about two and one-half times the strength of iron. It has been found particularly useful for oil well drilling and tubing lines. Its other general uses are similar to those of the crucible steel, except that it may be used where loads are somewhat heavier.

Plow Steel Rope—Combines lightness and great strength; is somewhat stiffer than crucible steel and nearly three times as strong. Used particularly for heavy mine hoisting, derricks, inclined planes, dredges, cableways, for heavy logging and similar uses. It is the most economical rope to use where the weight of the rope has to be considered or where the capacity of the machinery is to be increased without a corresponding increase in sheaves and drums.

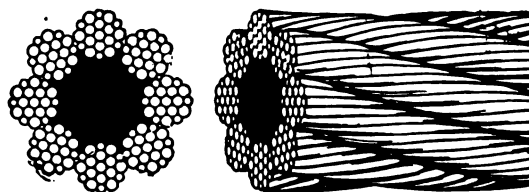
Monitor Plow Steel Rope—This is the highest strength rope made. It is somewhat stiffer in the same diameter than the plow and crucible steel grades, but, strength for strength, it is equally flexible. Very useful where great strength, lightness and abrasive resisting qualities are required.



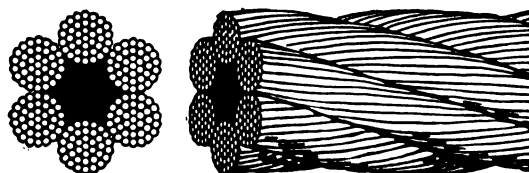
TRANSMISSION, HAULAGE OR STANDING ROPE (6x7)



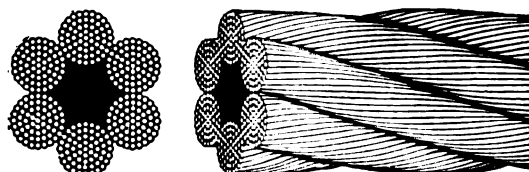
HOISTING ROPE (6x19)



EXTRA FLEXIBLE STEEL HOISTING ROPE (8x19)



SPECIAL FLEXIBLE STEEL HOISTING ROPE (6x37)



EXTRA SPECIAL FLEXIBLE HOISTING ROPE (6x61)

WICKWIRE SPENCER STEEL CORPORATION

Manufacturers of Wire Rope

WORCESTER, MASS.

BUFFALO, N. Y.

DISTRICT OFFICERS

BOSTON, MASS., 120 Franklin Street
PHILADELPHIA, PA., 237 North Sixth Street
DETROIT, MICH., 3044 West Grand Boulevard

CHICAGO, ILL., 215 West Ontario Street
TULSA, OKLA., 861 Mayo Building
SAN FRANCISCO, CAL., 111 Townsend Street

NEW YORK, N. Y., 120 Broadway

Products

WIRE ROPE, including the following qualities: Iron, Mild Steel, Crucible Cast Steel, Extra Strong Crucible Cast Steel, Plow Steel, Gray Strand and Phosphor Bronze.

For Concrete Reinforcement, see pages 94-96.

Information Required When Ordering

The following information is needed when ordering:

- (1) Diameter of rope.
- (2) Its exact length.
- (3) Number of strands.
- (4) Number of wires in each strand.
- (5) Kind of center core (hemp or wire).
- (6) Whether finish is bright or galvanized.
- (7) Type of construction (number and arrangement of wires and strands).
- (8) Kind of material from which it is made.

If uncertain on any point, give full information regarding use to which rope is to be put, loads, speed, size of drums or sheaves, etc. If it is to replace one of our own make, give date of order.

Wire Rope

Wire ropes are as flexible as new hemp ropes of equal strength, are more durable in hoisting and, because uninfluenced by weather, are more efficient as standing ropes.

Where possible, use larger drums and sheaves than those indicated in the tables following, particularly when high speeds are employed or working strain is greater than one-fifth the breaking strain. In general, the larger the drum or sheave, the longer the rope will last. As wear increases with speed, it is better to increase the load, within certain limits, than the speed. The shorter the lay of wire rope, the greater the flexibility.

Wire rope must not be coiled or uncoiled like hemp rope. It should be unwound as from a reel, to prevent kinking.

Special ropes made to order, in accordance with specifications, provided order is large enough to justify manufacture.

Wickwire

TRADE-MARK

Transmission, Haulage or Standing Rope

Composed of 6 strands, 7 wires to the strand, used for haulage in mines, on inclined planes, on tramways and in the yards of manufacturing plants. Also used for oil well drilling and sand lines.

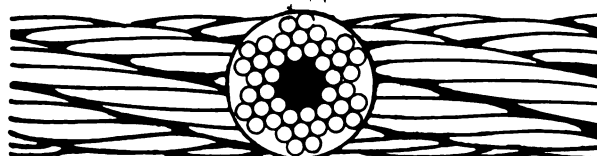
The wires are nearly twice as large as those in hoisting rope. Will withstand the abrasive wear usual in haulage work. Less flexible than hoisting rope. For bending, where greater flexibility is required, ropes composed of finer wires are usually preferred.

Made in five grades, or strengths, as follows:

Iron—Not extensively used except in the smaller sizes. Composed of very soft wires without high tensile strength. Some of the sizes below are never used, but are given for comparison.

Crucible Cast Steel—Particularly adaptable for mine haulage work including tail rope and endless haulage systems, gravity hoists, as well as coal and ore dock haulage ropes operating small grip cars. Used where abrasion is severe and flexibility required.

Extra Strong, Crucible Cast Steel—Use is practically the same as the Crucible Steel, except that smaller size may be used for the same strength.



TRANSMISSION, HAULAGE OR STANDING ROPE (6x7)

TRANSMISSION, HAULAGE OR STANDING ROPE DATA
6 strands, 7 wires to the strand—1 hemp core

Diameter in.	Approximate circumference in.	Approximate weight per ft., lbs.	Allowable working strains, tons of 2000 lbs.					Minimum diameter of drum or sheave, ft.	
			Iron	Crucible Cast Steel	Extra Strong Crucible Cast Steel	Plow Steel	Gray Strand	Iron	Crucible and Extra Strong Crucible Cast Steel, Plow Steel and Gray Strand
1 1/4	4 3/4	3.550	6.40	12.60	14.60	16.80	18.0	16	11
1 1/2	4 3/4	3.000	5.60	10.60	12.60	14.60	16.0	15	10
1 3/4	4	2.450	4.60	9.20	10.80	12.40	13.0	13	9
1 1/2	3 1/2	2.000	3.80	7.40	8.60	9.80	10.0	12	8
1	3	1.580	3.00	6.20	7.00	7.80	8.4	10 1/2	7
3/4	2 1/4	1.200	2.40	4.80	5.60	6.20	6.6	9	6
11/8	2 1/4	.890	1.70	3.70	4.20	4.60	5.0	7 1/2	5
1	2 1/8	.750	1.50	3.10	3.30	3.60	4.0	7 1/4	4 3/4
3/4	2	.620	1.20	2.60	2.90	3.20	3.5	7	4 1/2
3/4	1 3/4	.500	.96	2.00	2.20	2.40	2.6	6	4
3/4	1 3/4	.390	.74	1.50	1.80	2.00	2.2	5 1/2	3 1/2
3/4	1 3/4	.300	.52	1.10	1.25	1.40	1.5	4 1/2	3
3/4	1 3/4	.220	.44	.92	1.05	1.20	1.3	4	2 3/4
3/4	1	.150	.34	.70	.79	.88	.....	3 1/2	2 1/4
3/4	3/4	.125	.24	.50	.59	.68	.....	3	1 3/4
3/4	3/4	.100	.....	.....	.....	.53	.....	.....	1 1/2
3/4	3/4	.040	.....	.....	.....	.....	.....	.....	1 1/4
3/4	3/4	.....	.....	14	.....	.....	.....	.....	.....

*Iron, Crucible and Extra Strong Crucible Cast Steel, and Plow Steel only.

†Plow Steel only.

‡Crucible Cast Steel only.

Plow Steel—Recommended in place of Crucible or Extra Strong when necessary to reduce weight of rope or to increase strength without increasing size. Composed of harder wires capable of withstanding more external wear.

Gray Strand—The strongest rope of this construction and somewhat stiffer than the preceding qualities. Especially designed for service under exceptionally severe conditions. Should be used over larger sheaves than the preceding qualities.

Standard Hoisting Rope

Composed of 6 strands, 19 wires to the strand. The wires are smaller than those in the 6x7 construction, more flexible, and can be more readily passed around sheaves and drums of moderate size. The component wires being finer, it is not expected to stand as much abrasion as the coarser haulage rope.

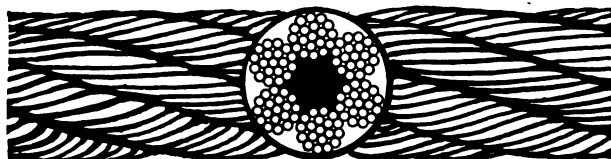
More extensively used in a greater variety of work than any construction.

Six grades or strengths, as follows:

Iron—For use on elevators employing separate counterweight ropes. The wires are soft, tough and pliable, permitting rope to withstand constant bending over small sheaves. Should not be used for any other purpose except where recommended by manufacturer.

Mild Steel—For traction elevators in tall buildings where, on account of usual quick starting and stopping, a stronger and lighter rope is required than the Iron quality. Not recommended for all styles of elevators.

Crucible Cast Steel—For mine hoisting, logging, elevators, derricks, hay presses, dredges, cableways, inclined planes, coal hoists, conveyors, ballast unloaders, skip hoists and many other kindred applications. Made of the best quality crucible cast steel and has double the strength of iron in the same diameter.



STANDARD HOISTING ROPE (6x19)

STANDARD HOISTING ROPE DATA

6 strands, 19 wires to the strand—1 hemp core

Diameter, in.	Approximate circumference, in.	Approximate weight, per ft., lbs.	Allowable working strain, in tons of 2000 lbs.						Minimum diameter of drum or sheave, ft.		
			Iron	Mild Steel	Crucible Cast Steel	Extra Strong Crucible Cast Steel	Plow Steel	Gray Strand	Iron	Mild Steel	Crucible and Extra Strong Crucible Cast Steel, Plow Steel and Gray Strand
2 3/4	8 3/4	11.95	22.20	.....	42.20	48.60	55.00	63.00	17	.....	11
2 1/2	7 7/8	9.85	18.40	.....	34.00	40.00	46.00	53.00	15	.....	10
2 1/4	7 1/4	8.00	14.40	.....	26.60	32.00	37.00	42.00	14	.....	9
2	6 3/4	6.30	11.00	.....	21.20	24.60	28.00	33.00	12	.....	8
1 7/8	5 7/8	5.55	10.00	.....	19.00	22.40	25.00	30.00	12	.....	8
1 3/4	5 1/2	4.85	8.80	.....	17.00	19.80	22.00	27.00	11	.....	7
1 1/2	5	4.15	7.60	.....	14.40	16.60	19.00	22.00	10	.....	6 1/2
1 1/4	4 3/4	3.55	6.50	10.80	12.80	14.60	16.00	20.00	9	7	6
1 3/8	4 1/2	3.00	5.60	9.00	11.20	12.80	14.00	17.00	8 1/2	6 1/4	5 1/2
1 1/8	4	2.45	4.56	7.60	9.40	10.60	12.00	14.00	7 1/2	5 3/4	5
1 1/4	3 3/4	2.00	3.72	6.10	7.60	8.60	9.40	11.00	7	5 1/4	4 1/2
1	3	1.58	2.90	4.80	6.00	6.80	7.60	9.00	6	4 1/2	4
3/4	2 3/4	1.20	2.36	3.70	4.60	5.20	5.80	7.00	5 1/2	4	3 1/2
1 1/8	2 1/2	1.03	.....	.....	.....	4.62	.....	.....	.....	.....	3 1/4
1 1/4	2 1/4	.89	1.70	2.70	3.50	4.04	4.60	5.30	4 1/2	3 1/2	3
1 1/8	2	.62	1.20	1.90	2.50	2.80	3.10	3.80	4	3	2 1/2
1 1/8	1 7/8	.50	.94	1.54	2.00	2.24	2.40	2.90	3 1/2	2 7/10	2 1/4
1 1/8	1 3/4	.39	.78	1.20	1.68	1.84	2.00	2.40	3	2 3/10	2
1 1/8	1 1/2	.30	.58	.92	1.30	1.45	1.60	1.90	2 3/4	2	1 1/4
1 1/8	1 1/4	.22	.48	.68	.96	1.06	1.15	1.35	2 1/4	1 1/4	1 1/2
1 1/8	1	.15	.30	.....	.62	.70	.76	.90	2	1 1/4	1 1/4
1 1/8	3/4	.10	.22	.....	.44	.49	.53	.63	1 1/4	.....	1

*Extra Strong Crucible Cast Steel only.

Extra Strong Crucible Cast Steel—Made from selected cast steel wire of higher tensile strength than Crucible Steel grade, and possesses greater strength. Its uses are similar to those of the Crucible Steel.

Plow Steel—Used particularly for heavy mine hoisting, derricks, inclined planes, dredges, cableways for heavy logging, coal and ore hoistings, stump pullers, wrecking ropes, heavy cranes and for all rough uses requiring great strength and toughness. Especially efficient for deep mine shafts and long inclines. Most economical to use where weight of rope has to be considered or where capacity of machinery is to be increased without a corresponding increase in size of sheaves and drums.

Gray Strand—A rope of very great strength. Indispensable for heavy dredging, derricks, skidders, dredges, stump pullers. Used where extra severe strains and hard conditions of service prevail. Somewhat stiffer in the same diameter than Plow and Crucible grades, but strength for strength it is equally flexible. Sheaves should be somewhat larger for this quality of rope if possible, to attain the best results.

Extra Flexible Hoisting Rope

Composed of 8 strands, 19 wires to the strand. Contains two more strands than standard hoisting rope, adding greatly to its flexibility and permitting its being used over comparatively small sheaves and drums.

Five grades or strengths, as follows:

Iron—Extremely flexible and recommended for elevators where sheaves are small and rope is subjected to reverse bends. Should not be used for any other purpose except where recommended by the manufacturer.

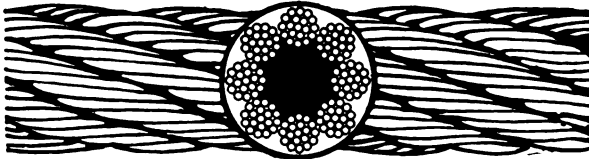
Crucible Cast Steel—For use over fairly small sheaves on derricks, steam dredges, coal and ore handling machinery, pile drivers and also for logging purposes. Not quite as strong in same diameter as the regular 6x19 Hoisting Rope, due to its large hemp center, but more flexible. Under special conditions where load is light, it gives splendid service, owing to its ability to withstand severe bending.

Extra Strong Crucible Cast Steel—Made from

selected cast steel wire of higher tensile strength than Crucible Steel grade. May be used for somewhat heavier loads. Its other general uses are similar to those of the Crucible Steel.

Plow Steel—Combines flexibility and strength. Adapted for crane service, dredges, derricks, and other uses where small sheaves necessitate a flexible rope and where greater strength is required than for preceding grades in this construction.

Gray Strand—Very efficient for its strength where loads are heavy. The strongest rope that can be made in this type of construction. Sheaves should be somewhat larger with this quality so as to insure greater service and durability.



EXTRA FLEXIBLE HOISTING ROPE (8x19)

EXTRA FLEXIBLE HOISTING ROPE DATA
8 strands, 19 wires to the strand—1 hemp core

Diameter, in.	Approximate circumference, in.	Approximate weight per ft., lbs.	Allowable working strain, in tons of 2000 lbs.					Minimum diameter of drum or sheave, ft.	
			Iron	Crucible Cast Steel	Extra Strong Crucible Cast Steel	Plow Steel	Gray Strand	Iron	Crucible and Extra Strong Crucible Cast Steel, Plow Steel and Gray Strand
1 1/4	4 3/4	3.19	.....	11.60	13.0	14.80	16.0	.....	3.75
1 1/2	4 3/4	2.70	.....	10.20	11.0	12.80	13.0	.....	3.50
1 3/4	4 3/4	2.20	.....	8.40	9.4	10.40	11.0	.....	3.20
1 1/2	3 3/4	1.80	.....	6.80	7.6	8.60	9.2	.....	2.83
1 1/4	3 3/4	1.42	3.1	5.20	5.9	6.70	7.2	6.0	2.50
1 1/2	2 3/4	1.08	2.6	4.00	4.6	5.20	5.6	5.5	2.16
1 1/4	2 3/4	.80	1.9	3.06	3.8	4.00	4.4	4.5	1.83
1 1/2	2 3/4	.56	1.4	2.18	2.5	2.80	3.0	4.0	1.75
1 1/4	1 3/4	.45	1.2	1.74	2.0	2.32	2.4	3.5	1.50
1 1/2	1 3/4	.35	1.0	1.46	1.6	1.74	1.9	3.0	1.33
1 1/4	1 3/4	.27	.....	1.14	1.28	1.42	.....	.....	1.16
1 1/2	1 3/4	.20	.....	.84	.93	1.02	.....	.....	1.00
1 1/4	1 3/4	.13	.....	.55	.61	.67	.....	.....	.83
1 1/2	1 3/4	.09	.....	.36	.40	.45	.....	.....	.75

Special Flexible Hoisting Rope

Composed of 6 strands, 37 wires to the strand. Very flexible and much used on cranes and similar machinery, where rope is operated at high speed and sheaves and drums are of necessity small. Its wires are smaller than the Standard Hoisting construction, and will not stand as much abrasive wear.

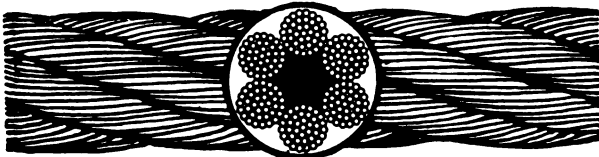
A little over 50% of the wires are in the inner layers of the strand, protected from abrasion. This explains its particular advantages in addition to its flexibility.

Ropes larger than 1 3/4 in. in diameter, used on hoisting apparatus, are usually made of this construction rather than 6x19.

Made in four grades, as follows:

Crucible Cast Steel—Used extensively on electric cranes, dredges and for similar service requiring a strong, tough rope that will operate successfully over small sheaves.

Wires in this rope are much finer than those used in the standard hoisting rope, and consequently not as



SPECIAL FLEXIBLE HOISTING ROPE (6x37)

SPECIAL FLEXIBLE HOISTING ROPE DATA
6 strands, 37 wires to the strand—1 hemp core

Diameter, in.	Approximate circumference, in.	Approximate weight per ft., lbs.	Allowable working strain, in tons of 2000 lbs.				Minimum diameter of drum or sheave, ft.
			Crucible Cast Steel	Extra Strong Crucible Cast Steel	Plow Steel	Gray Strand	
2 1/4	8 3/4	11.95	40.00	47.00	53.00	55.00	.....
2 1/2	7 3/4	9.85	32.00	37.00	43.00	45.00	.....
2 3/4	7 1/4	8.00	25.00	30.00	35.00	37.00	.....
2 1/2	6 3/4	6.30	21.00	23.00	26.00	27.00	.....
2 1/4	5 3/4	4.85	17.00	19.00	22.00	23.00	.....
1 3/4	5 3/4	4.15	14.00	16.00	18.00	19.00	.....
1 3/4	4 3/4	3.55	12.00	14.00	16.00	17.00	3.75
1 1/2	4 3/4	3.00	11.00	12.00	14.00	14.00	3.50
1 1/4	4	2.45	9.00	10.00	11.00	11.00	3.20
1 1/2	3 3/4	2.00	7.00	8.00	9.00	9.20	2.83
1 1/4	3	1.58	6.00	6.00	7.00	7.40	2.50
1 1/2	2 3/4	1.20	5.00	5.00	5.00	5.80	2.16
1 1/4	2 3/4	.89	3.50	4.90	4.00	4.60	1.83
1 1/2	2 3/4	.62	2.20	2.50	3.00	3.20	1.75
1 1/4	1 3/4	.50	1.90	2.10	2.30	2.50	1.50
1 1/2	1 3/4	.39	1.45	1.65	1.85	1.90	1.33
1 1/4	1 3/4	.30	1.10	1.27	1.40	1.50	1.16
1 1/2	1 3/4	.22	.84	.93	1.00	1.06	1.00

suitable to withstand abrasion. On certain equipments, however, where bending stresses are severe, this feature is largely offset by the extra pliability of the rope.

Extra Strong Crucible Cast Steel—This type of construction occupies an intermediate place between Cast Steel and Plow Steel Rope, and is substituted for the former when it is desirable to increase the factor of safety in any given diameter of Cast Steel Rope.

Plow Steel—Largely used on electric traveling cranes, dredges and similar machinery, where loads are heavy and sheaves are of necessity small. Gives efficient service where conditions favor its use.

Gray Strand—The strongest rope of this construction, and suitable where conditions are unusually severe. Largely used on dredges, both for main hoist and spud ropes. Recommended where loads have to be increased

without corresponding increase in diameter.

Tiller or Hand Rope

Composed of 6 strands of 42 wires each, each strand being a wire rope in itself. It has 7 hemp cores, 1 large one in the center of the rope and 1 smaller one in each of the 6 strands. It is the most flexible of wire rope, and may be bent around very small

TILLER OR HAND ROPE DATA
6 strands of 42 wires each—252 wires in all—7 hemp cores

Diameter, in.	Approximate circumference, in.	Approximate weight per ft., lbs.	Diameter of drum or sheave, ft.
1 1/4	3	1.10	24
1 1/2	2 3/4	.84	21
1 3/4	2 3/4	.62	18
1 1/2	2	.43	15
1 1/4	1 3/4	.35	13 1/2
1 1/2	1 3/4	.28	12
1 1/4	1 1/4	.21	10 1/2
1 1/2	1 1/4	.16	9
1 1/4	1	.11	7 1/2
1 1/2	3/4	.07	6
1 1/4	3/4	.042	11

*Bright Iron and Bright Crucible Steel only, 6 strands, 19 wires to the strand.

†Bright Crucible Steel and Phosphor Bronze only, 6 strands, 19 wires to the strand.

‡Phosphor Bronze only.



TILLER OR HAND ROPE (6x42)

sheaves. It will, however, stand very little abrasive wear on account of the fine wires of which it is composed.

Two of the five grades are:

Bright Iron—Used as steering ropes, hand ropes for elevators or for weight ropes in hanging heavy doors.

Tiller Ropes should be operated only over perfectly smooth surfaces, because of the fineness of the wires composing each strand.

Bright Crucible Cast Steel—Where necessary to use rope of small diameter, the strength of larger Iron Hoisting Rope can be obtained by using 7/32-in. or 3/16-in. Cast Steel Tiller Rope.

Tiller Rope of galvanized iron or steel is furnished, if required.

JOHN A. ROEBLING'S SONS COMPANY

Wire Rope and Wire; Wire Rope Fittings; Copper Insulated
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TRENTON, N. J.

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A full line of WIRE ROPE FITTINGS, such as Hooks, Clamps, Clips, Pulleys, Sheaves, Sockets, Tackle Blocks, Thimbles, Turnbuckles, Slings; Alligator Wrenches, Reels for Hawsers, Riggers' Vise; Track Rollers, etc.

Our Engineering Department specializes in designing and constructing Suspension Bridges, Tramways, Cableways, and installations for the Transmission of Power by Wire Rope.

Uses of Wire Rope and Cables

Wire rope and cables are made for the following purposes: conveyors, tramways, power transmission, suspension bridges, cableways, elevators, airplanes, for drilling, dredges, steam shovels, rigging, and all hoists and haulages where wire rope can be advantageously used.

Blue Center Steel Rope

Blue center steel rope is special rope for special purposes, and is recommended as the very best rope for exceptional service where extreme conditions tend to produce extraordinarily severe and unexpected strains.

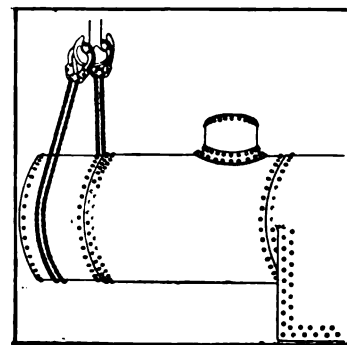
Wire Rope Slings for Industrial Plant and Construction

Roebling wire rope slings are the ideal practical equipment for the safe and efficient hoisting of heavy materials in shop and field. They are made from our blue center steel; are compact, light and adjustable, and through equalizing features in certain types the stress of the load lifted is distributed throughout the entire sling. Forgings in tension are eliminated wherever possible. The slings are made in the anchor, bridge

and many special industrial types. Complete information gladly furnished.
Send for Catalogue A-247.

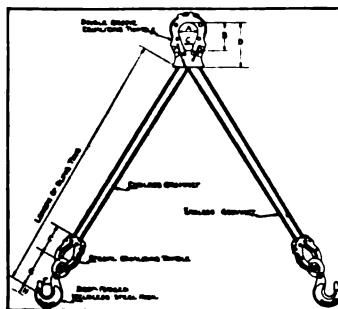


ANCHOR SLING



WIRE ROPE SLING CS-160

"Blue Center Steel" equalizing grommet slings for handling large circular bodies



WIRE ROPE SLING CS-175



ROEBLING WIRE ROPE CLIP

WIRE ROPE CLIP TESTS ON 6x19 PLOW STEEL ROPE

Diameter of rope, in.	Number of clips	Length of wrench, in.	Ultimate strength of rope, lbs.	Clip strength, lbs.	Efficiency, per cent
$\frac{1}{2}$	3	12	20,000	15,800	79.00
$\frac{3}{8}$	4	12	31,000	23,900	77.09
$\frac{1}{4}$	5	18	46,000	35,600	77.39
$\frac{3}{16}$	5	18	58,000	45,900	79.13
$\frac{1}{8}$	5	24	76,000	59,200	77.89
$\frac{1}{16}$	5	24	94,000	75,200	80.00
$\frac{1}{32}$	6	24	116,000	95,300	82.15

COMPARATIVE BREAKING STRENGTHS OF WIRE ROPE PER GIVEN DIAMETER IN TONS OF 2000 LBS.

ROEBLING STANDARD HOISTING ROPE (6x19)

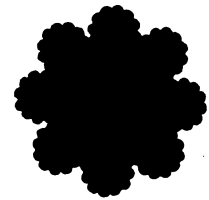
Diameter, in.	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	4 3/4	5	5 1/4	5 1/2	5 3/4	6	6 1/4	6 1/2	6 3/4	7
Iron, approx. strength.....	111	92	72	55	50	44	38	33	28	22	18	14	11	8	6	4	3	2	1	1
Cast steel.....	211	170	133	106	96	85	72	64	56	47	38	30	23	17	12	10	8	6	4	3
Ex. strong cast steel, approx. strength	243	200	160	123	112	99	83	73	64	53	43	34	26	20	14	11	9	7	5	4
Plow steel, approx. strength	275	229	186	140	127	112	94	82	72	58	47	38	29	23	15	12	10	8	5	4
Blue center steel, approx. strength	315	263	210	166	150	133	110	98	84	69	56	45	35	28	19	14	12	10	7	5
Approximate weight per ft., lbs....	11.95	9.85	8	6.30	5.55	4.85	4.15	3.55	3	2.45	2	1.58	1.2	.89	.62	.50	.39	.30	.22	.15



ROEBLING HOISTING ROPE (6x19)

ROEBLING EXTRA PLIABLE HOISTING ROPE (8x19)

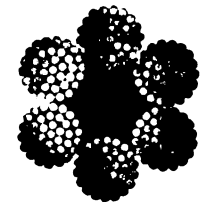
Diameter, in.	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	4 3/4	5
Cast steel, approx. strength.....	58	51	42	34	26	20	15.3	10.9	8.7	7.3	5.7	4.2	2.75	1.8	
Extra strong cast steel, approx. strength	66	57	47	38	29.7	23	17.6	12.4	10.1	8	6.3	4.66	3.05	2.02	
Plow steel, approx. strength	74	64	52	43	33	26	20	14	11.6	8.7	6.9	5.12	3.35	2.25	
Blue center steel, approx. strength	80	68	56	46	36	28	22	15	12	9.5					
Approx. wt. per ft., lbs....	3.19	2.70	2.20	1.80	1.42	1.08	.80	.56	.45	.35	.27	.20	.13	.09	



ROEBLING HOISTING ROPE (8x19)

ROEBLING EXTRA PLIABLE HOISTING ROPE (6x37)

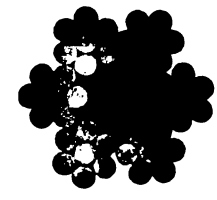
Diameter, in.	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	4 3/4	5	5 1/4	5 1/2	5 3/4	6
Cast steel, approximate strength.....	200	160	125	105	84	71	63	55	45	34	29	23	17.5	11.2	9.5	7.25
Extra strong cast steel, approximate strength	233	187	150	117	95	79	71	61	50	39	32	25	19	12	10	8
Plow steel, approximate strength	265	214	175	130	108	90	80	68	55	44	35	27	21	14	11.5	9.25
Blue center steel, approximate strength	278	226	184	137	113	95	84	71	58	46	37	29	23	16	12.5	9.75
Approximate weight per ft., lbs....	11.95	9.85	8	6.30	4.85	4.15	3.55	3	2.45	2	1.58	1.20	.89	.62	.50	.39



ROEBLING HOISTING ROPE (6x37)

ROEBLING STANDARD COARSE LAID ROPE (6x7)

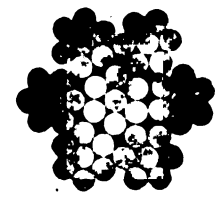
Diameter, in.	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	4 3/4	5
Iron, approx. strength.....	32	28	23	19	15	12	8.8	7.3	6	4.8	3.7	2.6	2.2	1.7	1.2
Cast steel.....	63	53	46	37	31	24	18.6	15.4	13	10	7.7	5.5	4.6	3.5	2.5
Extra strong cast steel, approx. strength	73	63	54	43	35	28	21	16.7	14.5	11	8.85	6.25	5.25	3.95	2.95
Plow steel, approx. strength	82	72	60	47	38	31	23	18	16	12	10	7	5.9	4.4	3.4
Blue center steel, approx. strength	90	79	67	52	42	33	25	20	17.5	13	11	7.75	6.5		
Approximate wt. per ft., lbs....	3.55	3	2.45	2	1.58	1.20	.89	.75	.62	.50	.39	.30	.22	.15	1.25



ROEBLING COARSE LAID ROPE (6x7)

ROEBLING GALVANIZED SUSPENSION BRIDGE CABLES

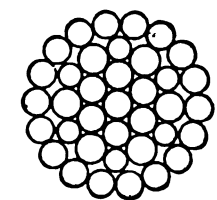
Diameter, in.	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	4 3/4	5
Approximate strength....	310	283	256	232	208	185	164	144	124	106	90	75
Approx. wt. per ft., lbs....	12.7	11.6	10.5	9.50	8.52	7.60	6.73	5.90	5.10	4.34	3.70	3.10



ROEBLING BRIDGE CABLE (7x7)

ROEBLING TRAMWAY STRAND (19 TO 55 WIRES, ACCORDING TO DIAMETER OF STRAND)

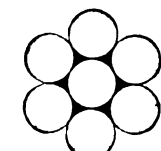
Diameter, in.	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4
Cast steel, approx. strength.....	124	108.4	88.8	71.8	60	49.2	37.6	27.6	19.2		
Plow steel, approx. strength	146	127.5	105	84.6	70.7	58.0	44.4	32.5	22.3		
Approximate wt. per 100 ft., lbs....	563	488	401	323	270	220	169	124	86		



ROEBLING TRAMWAY STRAND (19 TO 55)

ROEBLING GALVANIZED STEEL WIRE STRAND (7 WIRES)

Diameter, in.	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4
Approx. breaking strength in lbs.	8,500	6,500	5,000	3,800	2,300	1,800	1,400	900	500	400
Approx. wt. per 1,000 ft., lbs....	510	415	295	210	125	95	75	55	32	20



ROEBLING STEEL WIRE STRAND (7)

RAYMOND CONCRETE PILE COMPANY

Concrete Piles and Special Concrete Work

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NEW YORK, N. Y.

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BRANCH OFFICES IN ALL PRINCIPAL CITIES
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RAYMOND STANDARD CAST-IN-PLACE CONCRETE PILES.
RAYMOND COMPOSITE (WOOD-CONCRETE) Piles.
RAYMOND PRE-CAST PILES: Bearing and Sheet.
CONCRETE WORK of a Special Nature.

Slogan

A form for every pile—
A pile for every purpose.

Services and Facilities

We have on our staff and at your service, experts in the design and installation of concrete piles for all purposes and to meet all conditions.

Engineering—Our engineering department is available to architects and engineers at all times for investigation work and consultation, and we will gladly submit recommendations, designs and estimates covering any problem within the scope of our business.

Equipment—Every Raymond driver is built of structural steel, scientifically designed for the most rapid and economical construction and the major portion of our equipment is built by ourselves at our machinshops.

Concrete Piles vs. Wood Piles

There are certain fundamental advantages that concrete piles have over the use of wood piles. Wood piles must be driven so that the cut-off is below permanent water line, whereas concrete piles may be cut off at any level, irrespective of the permanent water line. Wood piles are often broomed or broken while being driven, thus reducing, if not eliminating their supporting power, whereas the Raymond type of concrete pile is not subject to distortion in driving.

In marine work wood piles most frequently are creosoted for protection against marine borers, whereas concrete piles are not subject to such destruction. Wood piles very often require considerable shoring, underpinning, sheeting, pumping and deep excavation, whereas this can usually be eliminated partially, if not entirely, by the use of concrete piles. Furthermore, there is an important saving in time by the use of concrete piles, when the footings can be placed immediately the concrete pile has been driven.

Classification of Concrete Piles

Concrete Piles are of two distinct types:

- (1) Concrete piles, which are made in place, commonly referred to as "cast-in-place" concrete piles.
- (2) Concrete piles which are cast in moulds and then driven like wooden piles and are referred to as "pre-cast" concrete piles.

Cast-in-place piles are divided into two classes:

(a) Those in which a form is left in the ground to preserve the integrity of the finished pile.

(b) Those in which the concrete is placed by means of a temporary driving form which is removed before the concrete hardens and leaves the pile confined only by the loose earth. The green concrete is then, obviously subject to the admixture of foreign materials, excess of water and distortion due to strains set up by soil pressures and the driving of adjacent piles.

Pre-cast concrete piles are those which are cast in a mould and then driven like a wooden pile and are referred to frequently as "pre-cast concrete piles."

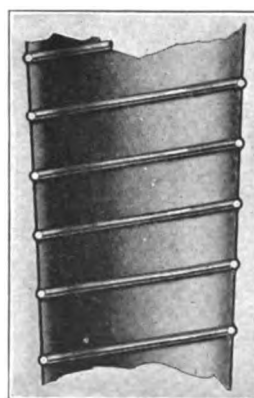
The Raymond Method

A collapsible steel core, usually 8 in. in diameter at the point and increasing in diameter at the rate of .4 in. per lin. ft. of length, is incased by the spirally reinforced steel metal shell. The core, thus incased, is driven to a proper penetration in accordance with the Engineering News formula. It is then collapsed and withdrawn from the shell, the shell remaining in the ground and maintaining the resistance encountered in the driving. The shell is then inspected, found perfect from tip to top and filled with concrete, thus making a perfect concrete pile.

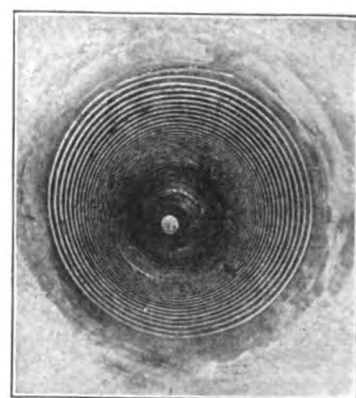
Under certain conditions we use a core with a larger diameter at the point.

Loads and Spacing—Usually Raymond concrete piles are driven to carry a working load of 30 tons each, but in some cases, loads of from 35 to 40 tons are safely carried.

A working load of 30 tons per pile is accepted by all building departments. The usual spacing of Raymond concrete piles is 2 ft. 6-in. centers for piles less than 30 ft. in length, and for piles in excess of 30 ft. in length, a spacing of 3-ft. centers is more desirable. In view of the very wide variation in soil conditions and



SECTION OF SPIRAL
SHELL



LOOKING DOWN INTO A DRIVEN
SHELL—30-FT. LONG

any difficulties surrounding a job, it is suggested that the nearest Raymond office be conferred with, so that the site can be investigated and recommendations made.

Sizes and Weight of Material—The standard Raymond concrete pile is installed by the use of a pile core 8 in. in diameter at the point and increasing in diameter .4 in. per lin. ft. of length. For instance, a pile 20 ft. in length would be 16 in. in diameter at the top, while one 37 ft. long would have a top diameter of 22.8 in.

The present limit in length of a standard Raymond concrete pile is 37 ft. 6 in. Where conditions are such as to require piles of greater length, we call attention particularly to the Raymond composite pile, a description of which will be found on the next page.

Working Loads—In calculating the resistance to penetration, the Engineering News formula, based on using a steam hammer, has been found most satisfactory. This formula follows:

$$L = \frac{2WH}{S + 0.1} \begin{cases} L = \text{Load in pounds} \\ W = \text{Weight of falling parts in pounds} \\ H = \text{Drop in feet of falling parts} \\ S = \text{Final penetration per blow in inches} \end{cases}$$

A No. 1 steam hammer has a weight of 5000 lbs. falling 36 inches.

A No. 2 steam hammer has a weight of 3000 lbs. falling 30 inches

Thus the carrying capacity of the Raymond concrete pile is not a matter of guesswork or speculation, but is susceptible of computation and demonstration.

Advantages of Taper—The Raymond concrete pile possesses an extreme taper and offers a maximum resistance for a given length. This has been proved by a comprehensive record of resistance encountered in driving plus an extensive series of loading tests, during which the real carrying power of the pile has been checked with the driving resistance.

Prices—The Raymond concrete pile is made in place and not sold by the foot, f.o.b. cars, consequently it is impossible to quote prices without knowing the conditions under which the work is to be done and for even approximate prices it is necessary to have some knowledge of the number of piles, probable length, the approximate spacing, soil conditions, accessibility of the site, etc.

Points of Superiority of Concrete Piles—

(1) Absolute permanency: immunity from decay or from the attacks of wood borers and destroyers.
(2) Economy, because of greater carrying capacity—meaning a less number of piles for a given load. The claim of greater carrying capacity rests upon several points—to wit:

(a) Greater size, therefore greater displacement and frictional area.

(b) Greater taper, therefore greater frictional value per square foot.

(c) Perfect shape, therefore perfect contact with the ground at every point.

(d) Possibility of inspection after driving, hence the ability to load to full capacity, instead of making a large allowance for inefficiency as in the case of wood piles subject to injury by overdriving, telescoping, departing from the vertical, and like defects, none of which are discernible at the moment when correction is possible.

(e) Decreased length of pile as a natural consequence of greater size and taper.

(3) Smaller and lighter footings, because of decreased number of piles.

(4) Decrease in total load to be carried, because of decreased weight of footings.

(5) Practical elimination of shoring, underpinning, sheeting, pumping and deep excavation and the reduction of masonry.

(6) Due to decreased number of piles and consequent reduction in width of wall footings, the center line of columns can be brought nearer to the building line.

(7) Important saving in time caused by:

(a) The smaller number of piles required.

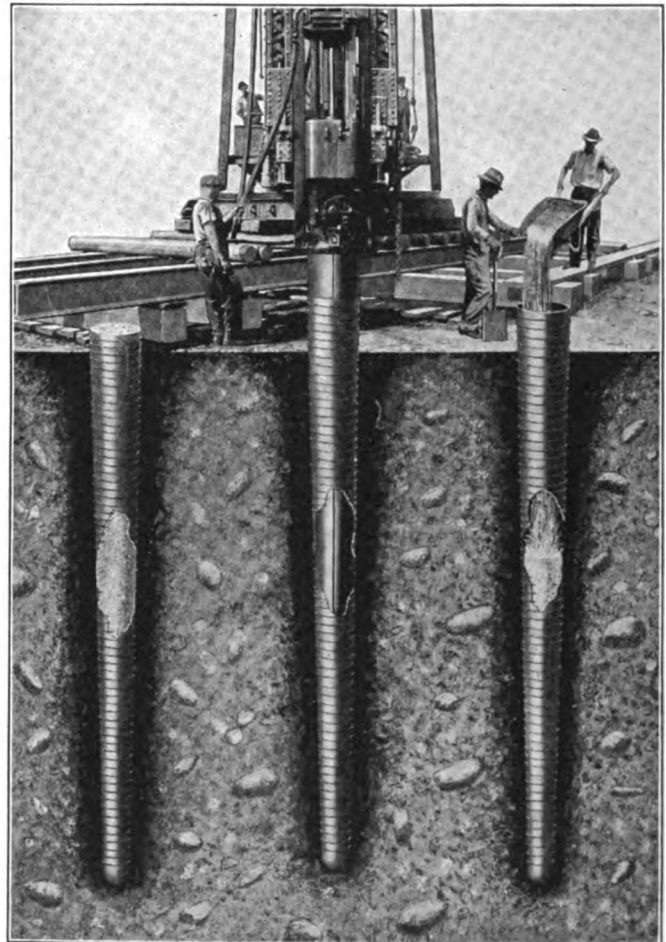
(b) The reduction in the amount of excavation, shoring, sheeting and pumping.

(c) The reduction in quantities of footing or masonry.

(d) The manufacture of the pile in place, from materials readily procurable in all localities, and the limit of manufacture to the actual number and exact length of piles required. There is no delay for cutting and trimming trees, hauling to shipping point, transporting for great distances by rail or water and delivery to the job, perhaps only to find that the piles are too long or too short.

Specification—If "Raymond concrete piles" are called for, this is of course sufficient. On the other hand, if it is for any reason inadvisable to name them specifically the following specifications will cover:

"Concrete piles shall be of a type specifically approved by the architect or engineer, and shall be placed in the following manner:



ESSENTIAL STEPS IN THE MAKING OF A RAYMOND CONCRETE PILE

"A collapsible steel mandrel or pile core 8 in. in diameter at the small end and 20 in. in diameter 30 ft. from that point shall be incased in a spirally reinforced steel shell and driven to a proper penetration. The pile core shall then be collapsed and withdrawn from the shell. Before placing the concrete, each shell shall be inspected and, being found perfect, shall thereupon be filled with concrete placed in accordance with the best practice,"

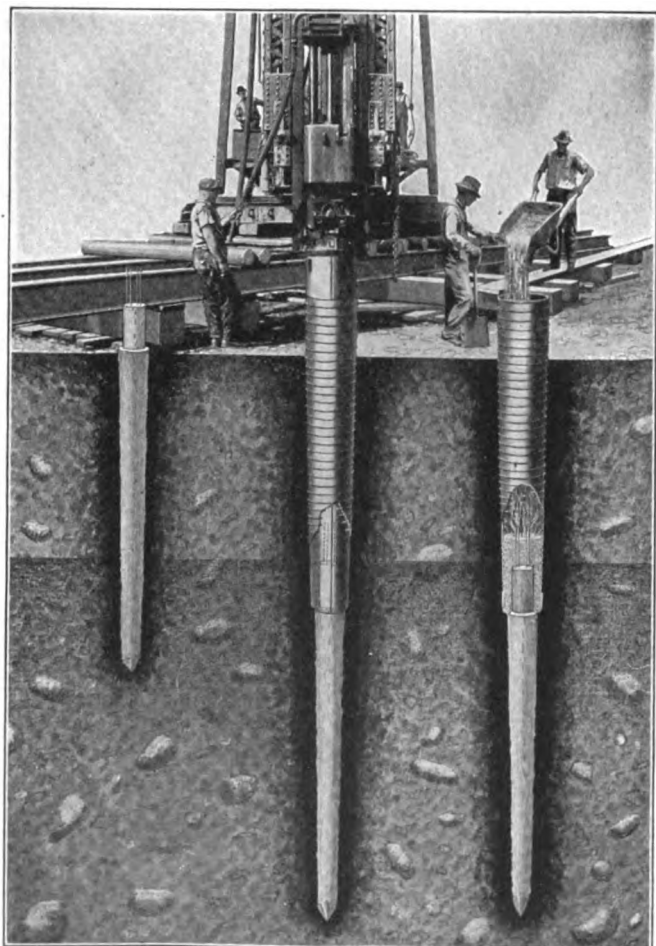
or

"Moulded-in-place piles shall be of a type suitable for the conditions and subject to the approval of the architect or engineer. They shall be formed in casings left in place, which shall be of sufficient strength to prevent distortion or bulging after mandrel has been withdrawn and while the cavity is being filled with concrete or during the driving of adjacent casings."

More About the Raymond "Cast-in-place" Pile

The Raymond pile is the only concrete pile having a permanent form which remains in the ground. This feature is essential for perfect dependable results. The province of the form or shell is manifold:

- (1) To serve as a form for the piles.
- (2) To prevent the admixture of foreign substances.
- (3) To retain the original moisture in the mixture until the concrete is thoroughly hardened.
- (4) To prevent distortion by external pressure, due to the driving of adjacent piles or accumulated pressures from displacement by the pile itself.
- (5) To perfectly retain the displaced earth forming the walls of the cavity, so that there may be no relaxation of the ground and therefore no loss of resistance when the displacing force (the core) is removed.



RAYMOND COMPOSITE PILE

- (6) To act as reinforcement of the pile until the concrete shall have attained its maximum strength.

Raymond Composite Piles

For use where depths greater than 37 ft. 6 in. are encountered, we have developed a composite pile made up by superimposing on a previously driven wooden pile, a concrete section, which latter section is nothing more nor less than a Raymond concrete pile made by the usual Raymond methods. The wood pile is ultimately driven so that the top of it is below the permanent water level and from that point to the bottom of the footing is the standard Raymond concrete pile, all of which is more fully illustrated herewith.

Pre-cast Piles

Pre-cast piles have a large and useful field, particularly in marine structures, such as docks, bulkheads, etc. The RAYMOND CONCRETE PILE COMPANY is prepared, through its experience, to give good advice upon the use of "pre-cast piles," and also to design and construct work in which a pre-cast pile can be used economically and advantageously.

Special Concrete Construction

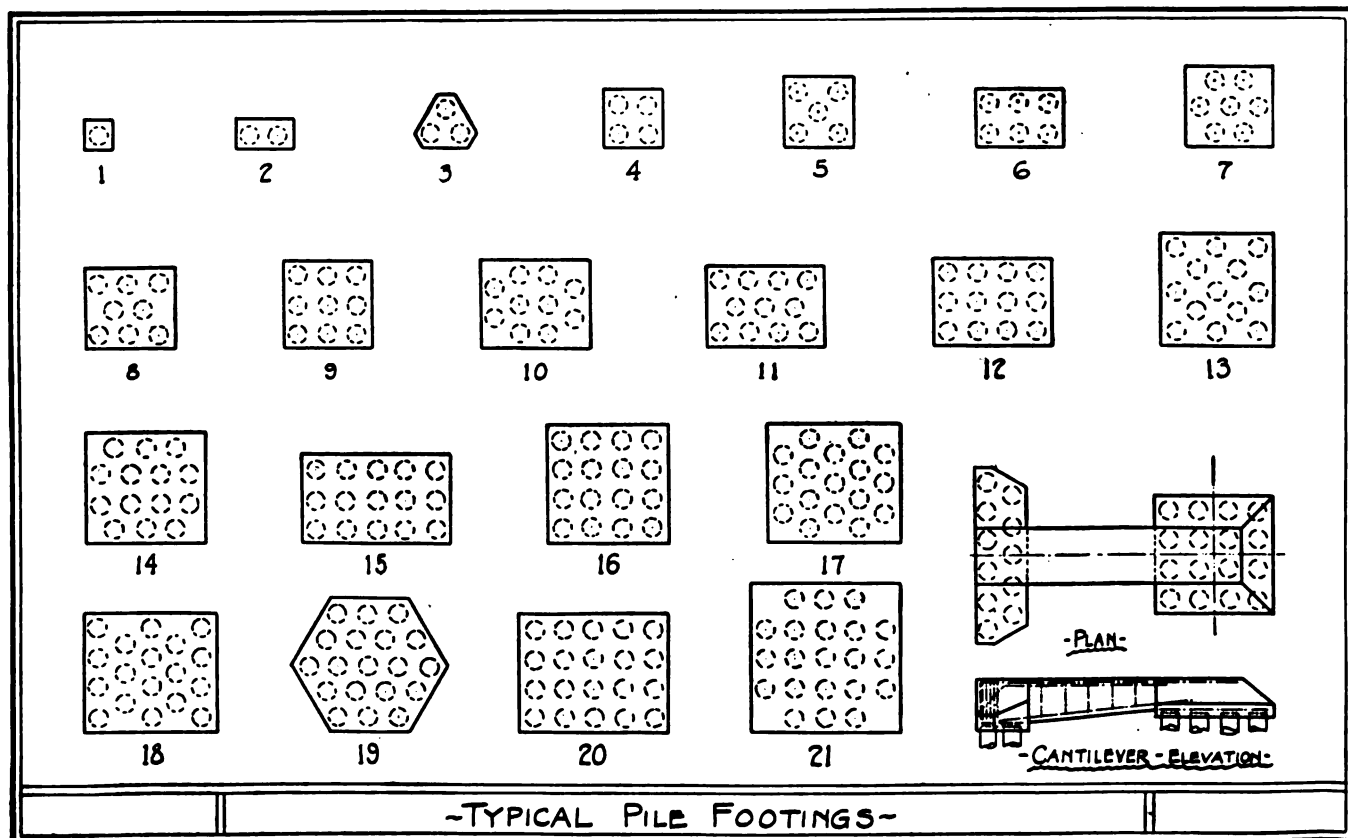
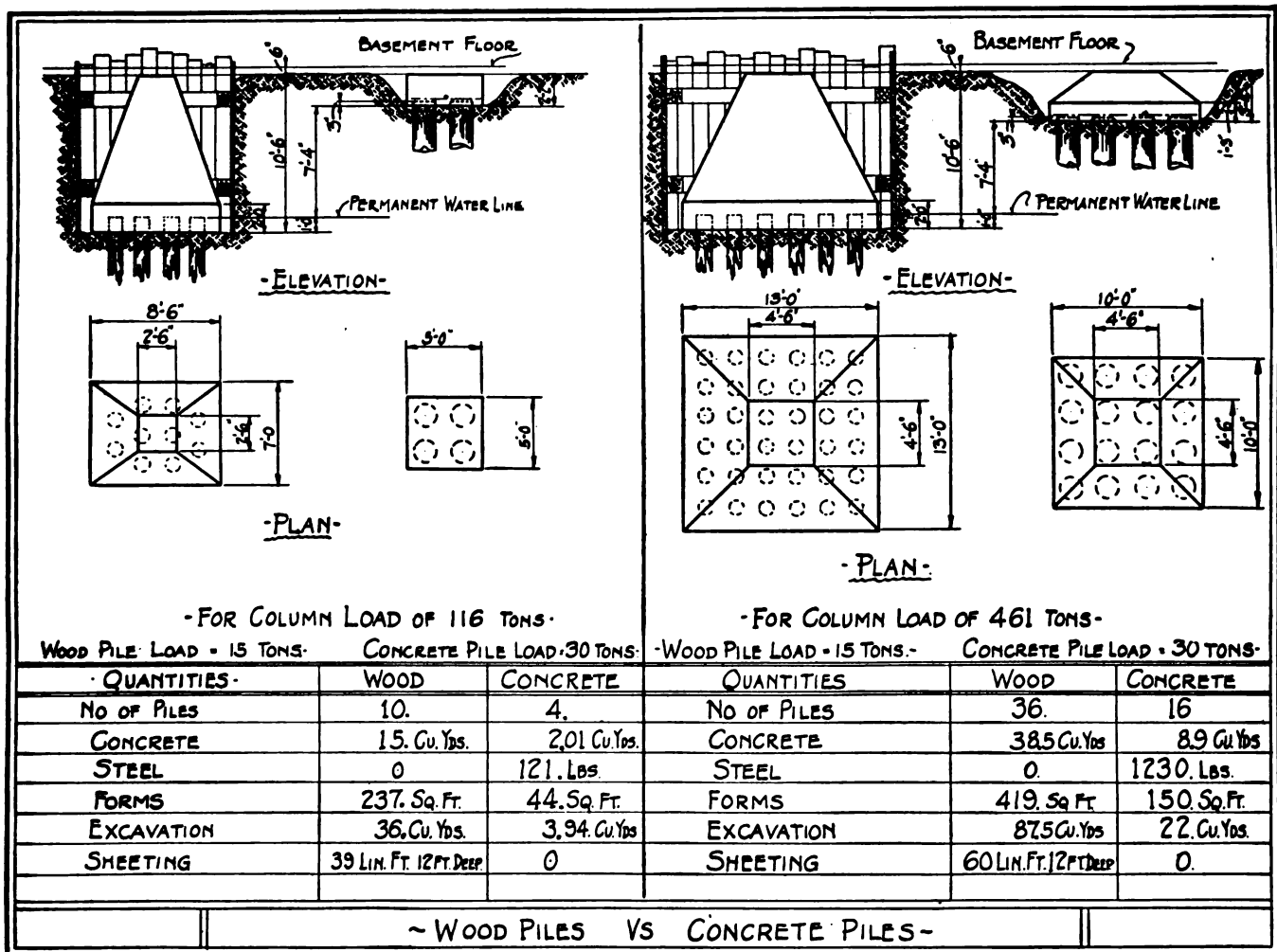
In addition to the placing of standard Raymond concrete piles for foundation of structures on land, we construct and design permanent docks, piers, bulkheads, trestles, storage bins, retaining walls, bridges, heavy foundations, shipways, drydocks, etc.

Each problem requires a special study for its solution and our experienced organization is yours to command.

References

Since 1901 when the first Raymond concrete pile was placed, we have placed up to date more than 15,000,000 ft. of Raymond concrete piles throughout the United States, covered by over 1000 separate and individual contracts, and will be only too glad to have you refer to any of the many architects, owners, engineers and general contractors with whom we have been associated. A partial list of installations follows:

Academic Group, U. S. Naval Academy, Annapolis, Md.
 International Bureau of American Republics, Washington, D. C.
 Post Office, East St. Louis, Ill.
 Auditorium, Denver, Colo.
 New Legislative Buildings, Regina, Saskatchewan, Canada
 City Hall, Des Moines, Iowa
 Soldiers' and Sailors' Memorial Building, Pittsburgh, Pa.
 Public Bath No. 1, Brooklyn, N. Y.
 Grandstand, National League Baseball Park, Pittsburgh, Pa.
 Statler Hotel, Buffalo, N. Y.
 Public School No. 17, New York, N. Y.
 Trumbull School, Chicago, Ill.
 Rowen High School, South Chicago, Ill.
 Public Library, New Orleans, La.
 Public Library, Council Bluffs, Iowa
 Standard Oil Company Office Building, Baltimore, Md.
 Lindeke-Warner Building, St. Paul, Minn.
 Maxwell-Briscoe Building, Chicago, Ill.
 General Electric Company Buildings, Schenectady, N. Y.
 Troy Laundry Machinery Company Building, Chicago, Ill.
 Brewster Building, Long Island City, N. Y.
 Ward Bakery Company Building, New York, N. Y.
 Lawler Flour Mill, New Orleans, La.
 Power House, West Jersey & Seashore R. R. Company (Pennsylvania R. R. System), Westville, N. J.
 Gas Holder, New York & Richmond Gas Company, Clifton, S. I., N. Y.
 Rapid Transit Car Barns, Brooklyn, N. Y.
 Canadian Pacific Railway Viaduct, Lethbridge, Alberta



SIMPLEX CONCRETE PILING

NEW ENGLAND FOUNDATION CO. INC.

120 TREMONT ST., BOSTON, MASS.
844 ELLICOTT SQ., BUFFALO, N. Y.

SIMPLEX PILE FOUNDATION CO. KEYSTONE BUILDING, PITTSBURGH, PA.

REPRESENTATIVES: MORRIS & REYNOLDS, Marshall Building,
CLEVELAND, OHIO

Products and Service

SIMPLEX CONCRETE PILES: Cast-in-place, Pre-cast and Composite.

Also, Steel Incased Concrete Piles, Open Concrete Caissons, Difficult Foundations (Chimneys, Tanks, etc.).

We will submit recommendations, designs and estimates on receipt of necessary data, or will visit the site of prospective work at any time for purposes of investigation and consultation, without obligation on your part.

Specific Types of Piles for Specific Conditions

No one type of concrete pile has as yet been designed that will economically and successfully meet all conditions of soils and loadings. We have developed several methods of installing concrete piles enabling us to meet successfully every condition.

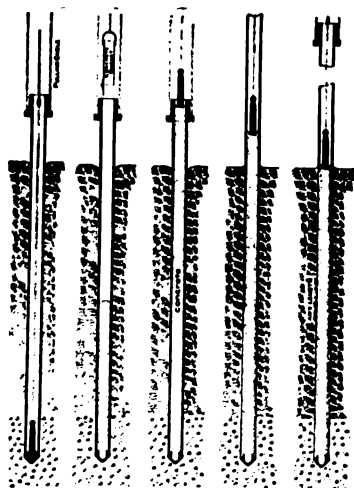
Simplex piles are of proved worth. They have been used extensively in the United States and Europe since 1903 for the support of buildings and other structures.

Advantages of Simplex Concrete Piles

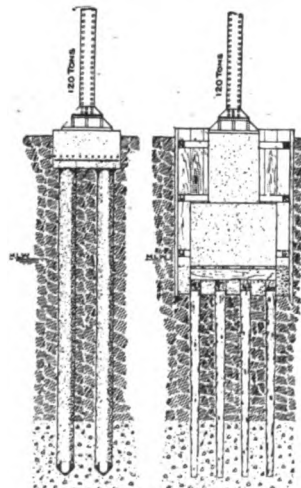
Simplicity; easily and quickly installed	Durability equal to that of natural rock; renewals never required
Constant sectional area of 201 sq. in.; equal bulk of concrete for each foot of length	Greatest frictional surface Unsurpassed carrying power Economy in time and cost over other types of foundations
Certainty of results	
Load transferred to firm bearing strata without reference to or dependence on poor soil above, although taking full advantage of it in addition to the end bearing value	

Standard Simplex Cast-in-place Concrete Piles

Suitable for nearly all conditions met with in unreliable ground. A cylindrical steel form, fitted with a cast iron point (joint is watertight) is driven to proper depth and filled with wet concrete. Form is withdrawn and the concrete is molded against the rough, compacted walls of the hole, resulting in tremendous skin friction



METHOD OF DRIVING SIMPLEX
CONCRETE PILES



COMPARISON OF CONCRETE
PILE AND WOOD PILE
FOUNDATIONS

in addition to its end bearing. *The concrete is placed before removal of form.*

In no case of Simplex pile construction has it been found that the back pressure of the earth was as great as the weight of the column of concrete in the pile. Reinforcement may be used, if desirable.

Standard Simplex concrete piles are 16 in. in diameter their entire length; they have been driven to depths of 75 ft.

Working load is usually 30 tons per pile, fully justified by long experience and many tests. Load may be varied in special cases.

Under average soil conditions, a spacing of 3 ft. on centers produces the best results.



HOW A SIMPLEX PILE COMPRESSES
SURROUNDING SOIL

Greatest compression of soil immediately about the pile. Disturbance ceases about one diameter from pile

Simplex Pre-cast Concrete Piles

Used for foundations for docks, wharves, sea walls and other water work, and for foundations where the ground is unusually unsatisfactory. A form is driven to proper depth as in the standard system. Wet concrete is poured into the form. A pre-cast reinforced concrete pile is lowered through the form; the projecting ends of the reinforcement extend into the wet concrete. The form is then withdrawn, leaving the pre-cast pile in position. Thin grout poured into the form as it is withdrawn materially increases skin friction in some cases. This method admits of positive results as to penetration without striking a blow on the pre-cast pile and entirely avoids the questionable consequences of jetting.

Standard size is 13 in. in diameter and 40 ft. in length, but can be installed in larger diameters and to greater depths.

Simplex Composite Piles

Economically meet soil conditions requiring great depth of penetration, where the permanent water line is considerably below the surface. A wood pile of required length and diameter is driven to proper depth, upon which is constructed a standard Simplex concrete pile. This method lends itself to the modifications of the standard system and readily admits the use of a pre-cast concrete pile on top of the wood pile.

THE KINNEY MANUFACTURING CO.

Manufacturers of Road Oiling Equipment

3529-3541 Washington Street
BOSTON, MASS.

NEW YORK, N. Y.

PHILADELPHIA, PA.
SAN FRANCISCO, CAL.

CHICAGO, ILL.

KANSAS CITY, MO.
HOUSTON, TEX.

Products

ROAD OILING EQUIPMENT: AUTO HEATERS, DISTRIBUTORS and SPRAYERS.

For Pumps and Strainers, see pages 634-635; for Friction Clutch Pulleys and Cut-off Couplings, see page 707.

The Kinney Auto Heater and Distributor

A machine for heating and spraying, by direct pressure, all varieties of bituminous materials, hot or cold, for road construction, maintenance or dust laying.

The Kinney auto distributor (Fig. 61) consists of a horizontal steel tank of stated capacity, furnished with the Kinney heating and circulating system and equipped with the Kinney pressure pump, spraying nozzles, valves and controlling levers complete. The outfit is mounted upon a specially designed motor truck chassis. The equipment is furnished in three sizes, 600-, 800- and



FIG. 61. THE KINNEY AUTO HEATER AND DISTRIBUTOR IN OPERATION

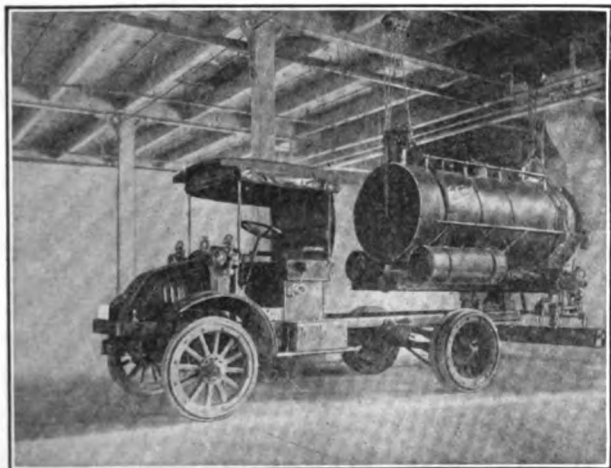


FIG. 67. TANK AND SPRAYING EQUIPMENT REMOVED FROM CHASSIS

Spraying equipment is mounted on separate subframe attached by bolts to frame of chassis. Bolts may be removed and entire oiling outfit lifted off, without detaching parts or disconnecting any piping of tank equipment.

1000-gal. tank capacity. The machine is so constructed that the entire equipment may be removed from the chassis and the truck used for other purposes (Fig. 67).

The heat is derived from kerosene oil burners arranged to convey heated gases through heating tubes placed horizontally through the tank interior similar to the construction of a water tube boiler. Pressure for spraying is supplied by the Kinney pump. The pressure is under direct control of the operator.

The spraying nozzles are adapted to produce a uniform spray in any desired volume (Fig. 61). Both width and volume of spray are under direct control of operator. The spray pipes are provided with spraying hoods to prevent dripping of oil on cross walks.

Full and complete description in Bulletin "A" furnished on request.

The Kinney Handy Heater and Sprayer

This machine (Fig. 144) is specially designed for road or highway repairing and maintenance. It is made in 2 sizes, 300- and 500-gal. tank capacity.

The tank is of steel, constructed with welded seams to prevent the possibility of leakage, and is mounted on a steel truck furnished with steel wheels fitted with broad tires. The machine is equipped with the Kinney pump driven by a gasoline engine. The pump is enclosed in a heating chamber, which prevents the hardening of cooled material and affords the necessary pressure for spraying through flexible metal hose and spraying nozzle. The facilities for heating may be wood, coke, coal or kerosene oil burners. The apparatus is self-loading from heating kettles or tank cars. The Kinney circulating system insures uniform temperature and prevents the coking or burning of material.

The machine will heat and spray under pressure all kinds of bituminous material, including the heaviest asphalt or tar products of any desired degree of temperature, and in any required volume of application.

Write for Bulletin "B" giving full particulars and prices.

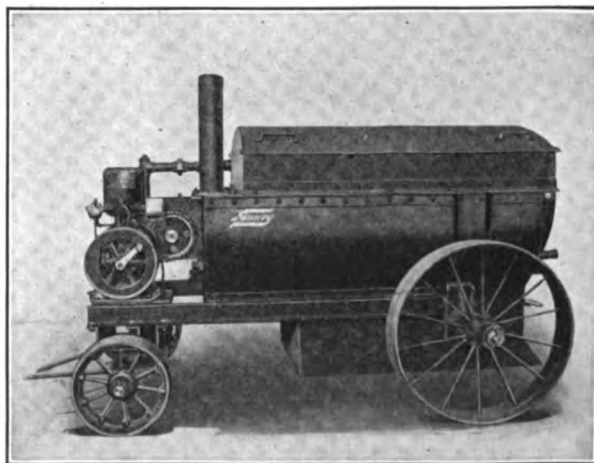


FIG. 144. THE KINNEY HANDY HEATER AND SPRAYER

SYMONS CLAMP & MFG. CO.

Column Clamps

TELEPHONE
LAWNDALE 0652

2112-2116 South Sawyer Avenue
CHICAGO, ILL.

BRANCH OFFICES

NEW YORK, N. Y., Pulitzer Building—Telephone, Beekman 4000

KANSAS CITY, MO., Interstate Building—Telephone, Harrison 6167

REPRESENTATIVES IN LEADING CITIES

Products

SYMONS COLUMN CLAMPS.

Also Symons Bar-ties and Bar-tie Supports.

Description

Symons column clamps have been designed to save time in erecting forms for concrete columns, and have so effectively accomplished their purpose that they are now recognized by most of the leading contractors in this country to be one item of their standard equipment.

They are made of mild steel, are suitable for both square and rectangular columns and are very quickly applied and removed from a form. One size clamp usually suitable for all the columns in a construction. There are no loose parts to become lost, and the wear and tear are negligible.

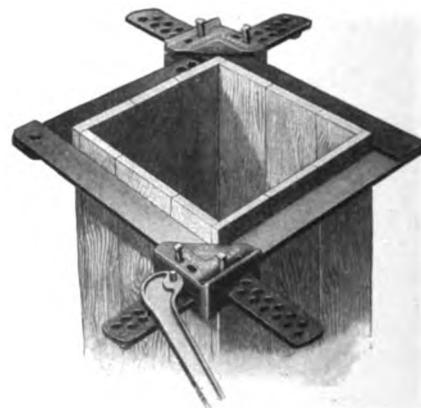
The savings derived from their use is so pronounced that the company devised a means for putting them out

on rental orders, making shipment from warehouse stock, located in principal cities.

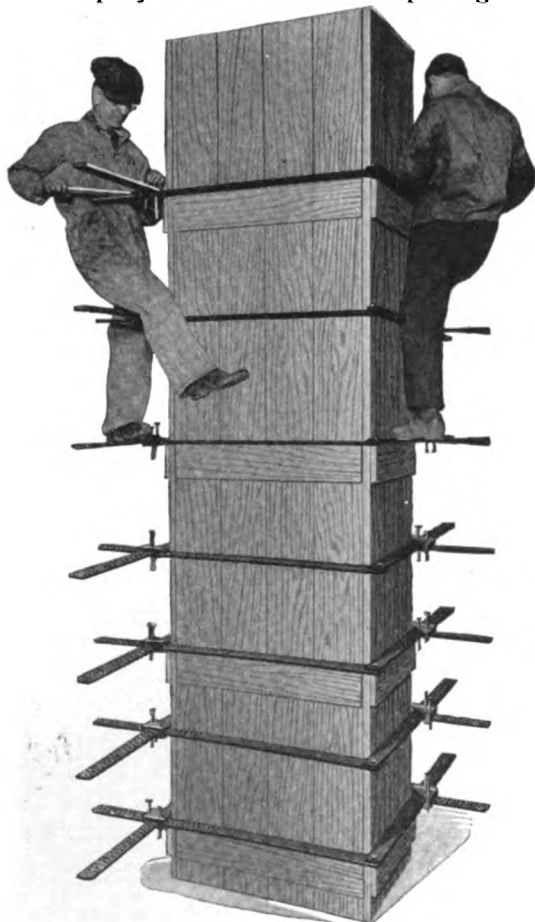
Rental Proposition

The clamps may be rented on terms that insure or guarantee a saving. All rental contracts contain a 90-day option of purchase, the paid rentals to apply. This rental proposition guarantees a saving even when figured on a rental basis, and has proved so attractive to contractors that within the last five years Symons clamps have come into almost universal use and seldom need an introduction in a contractor's office.

Symons clamps made good when form lumber was selling for \$25.00 and \$30.00 per thousand, and carpenters were being paid 50c and 60c per hour. Surely they ought to make good under present conditions.



APPLICATION OF SYMONS COLUMN CLAMPS
Showing also tightening wrench



SETTING UP COLUMN FORM WITH SYMONS CLAMPS

SIZES AND SPECIFICATIONS OF SYMONS COLUMN CLAMPS

Size of clamp, in.*	Arms (mild steel), in.	Adjustment, in.	Size of columns (square or rectangular) for which clamps are suitable. Size is net of concrete, in.
30 x 30	2 x $\frac{5}{16}$ x 30	14	20 x 20 to 9 x 9
36 x 36	2 x $\frac{5}{16}$ x 36	17	25 x 25 to 10 x 10
48 x 48	2 $\frac{1}{2}$ x $\frac{3}{4}$ x 48	22	36 x 36 to 14 x 14
60 x 60	3 x $\frac{3}{4}$ x 60	24	48 x 48 to 24 x 24
48 x 72	2 $\frac{1}{2}$ x $\frac{3}{4}$ x 72	24	34 x 58 to 12 x 36
72 x 72	2 $\frac{1}{2}$ x $\frac{3}{4}$ x 72	30	58 x 58 to 36 x 36

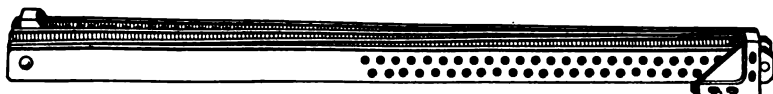
*Above specifications are for column forms made of 2-in. boards. With 1-in. boards, 30-in. size is suitable for columns 22x22 in. down to 11x11 in., etc.
**"Size of clamp" indicates length of clamp arm only. Does not mean size of column for which clamp is suitable.

Sample Clamp

The SYMONS CLAMP & MFG. CO. has never employed a road salesman, but on request, sends prepaid a sample clamp which speaks for itself in more convincing language than a salesman might command in telling about it. If not acquainted with this popular clamp, send a postcard at once. Procure a sample and a list of over 1000 contractors in this country who will testify as to its worth.

Immediate Shipment

Immediate shipment from stock at the following points: New York, Chicago, Minneapolis, Kansas City, San Francisco, Los Angeles, Seattle.



SYMONS COLUMN CLAMP, COMPLETE

AQUABAR PRODUCTS COMPANY

Waterproofing Engineers and Contractors

Manufacturers of Proofing Products

112 South 16th Street
PHILADELPHIA, PA.

BRANCH OFFICES IN PRINCIPAL CITIES

Products

WATERPROOFING, ACIDPROOFING, ALKALI-PROOFING, OILPROOFING and BRINEPROOFING COMPOUNDS.



TRADE-MARK

Aquabar Tankcoat

A heavy black coating for metal, concrete or wood tanks. It will neither crack nor peel and is impervious to both acids and alkalis.

Aquabar Floorlife

A colorless liquid for hardening and waterproofing the surfaces of concrete floors.

Services

Research; Designing; Engineering and Contracting as applied to all Proofing problems.

Research Department

For sixteen years the Aquabar organization has been successfully solving proofing problems of every nature. Well equipped chemical and testing laboratories, directed by ranking men in their respective professions, enable us to offer our clients an unusually comprehensive research service.

The elimination of damaging water conditions is only one field covered by this Company. Many manufacturing concerns wish to protect their plants or products against certain chemical conditions. It is the business of this organization to advise and furnish the remedy in such cases.

Designing Department

There are many instances where apparently reputable products have failed to accomplish the results claimed for them. This is usually caused either by the selection of unsuitable products or by incorrect designing. This department may be consulted without charge at any time and will prepare suitable plans to guard against any unusual proofing conditions.

Contract Department

Many engineers or architects prefer that the actual proofing work be done by the manufacturer of the products used. For those who desire it, the Contract Department will apply Aquabar products or will erect those portions of structures where Aquabar products are used, either on a lump sum or cost-plus basis. Construction work done by our Company is guaranteed to be satisfactory in every particular.

"Waterproof Specification Index and Guide"

To assist engineers and architects in selecting the proper methods and materials for waterproofing in building construction, this Company has edited a practical handbook, dealing with standard problems of this character. It will be sent upon request.

Aquabar Lastic Paint

An elastic paint which will neither peel nor crack. It should be specified whether the paint is desired for use on concrete, wood, metal or asphalt coating.

Aquabar Oilproofing

A coating for concrete tanks to protect them from crude oil or fuel oil.

Aquabar Weathershed Roofcoat

For renewing old, built-up, metal or composition roofs and as an overcoating for new roofs.

Aquabar Plaster Bond and Dampproofing

A bituminous product of unusual elasticity and adhesiveness. It is applied with either a brush or spray and flows readily into the smallest cracks, forming an impervious dampproof film.

Aquabar Glascoat

A colorless liquid, applied with a brush or spray, for weatherproofing the exterior surfaces of masonry walls. This liquid does not change the texture nor discolor the surface.

Aquabar Integral

An integral waterproofing for concrete, cement mortar and stucco.

Aquabar Fibrous Insulite

A black, plastic, waterproofing membrane which is extremely adhesive. It is applied with a towel.

Aquabar Seal System of Waterproofing

A combination of the integral and membrane methods. A plastic membrane (Aquabar Fibrous Insulite) is used between two integrally waterproofed concrete slabs. If cracks or fractures occur in the concrete work, they are automatically sealed by the membrane.

Aquabar Canvascoat

A preparation in either white or khaki color for waterproofing canvas. It is fire resisting, will not crack nor rub off and does not stiffen the fabric. Applied with either brush or spray.

THE GENERAL FIREPROOFING COMPANY

Waterproofing and Dampproofing Products and Technical Paints

YOUNGSTOWN, OHIO

BRANCH OFFICES

CHICAGO, 325 W. Madison Street
NEW YORK, 257-63 E. 133rd Street
BOSTON, 125 Federal Street
SYRACUSE, 707 Keith Theater Building
PHILADELPHIA, 512 Bulletin Building
ATLANTA, 257-63 Decatur Street

BALTIMORE, Builders' Exchange, 15 E. Fayette Street
CLEVELAND, Builders' Exchange, Rose Building
KANSAS CITY, 1009 Waldheim Building
OMAHA, 213 Kennedy Building

MILWAUKEE, 1018 First Wisconsin National Bank Building
SAN FRANCISCO, 20 Beale Street
LOS ANGELES, 618 Washington Building
BUFFALO, 824 Ellicott Square
MINNEAPOLIS, 754 Builders' Exchange

EXPORT DEPARTMENT, 438 Broadway, NEW YORK

Products

INTEGRAL WATERPROOFING, Paste and Powder; FOUNDATION BRUSH COATING; MOP COATING; WATERPROOF FELT; SATURATED FABRIC; ACIDPROOFING; COLORLESS WATERPROOFING; CEMENT and MASONRY COATING (in colors); HARDENER and DENSIFIER for concrete floors; FLOOR PRIMER; FLOOR ENAMEL (in colors); WOOD PRESERVATIVES; DAMPPROOFING COATING; STAINPROOF STONE BACKING; MASTIC CEMENT; PROTECTIVE COATING (for steel); GALVANIZED STEEL PRIMER; BONDING COMPOUND.

For Metal Lath Reinforcement, see pages 84-87.

Service

Ordinary waterproofing and dampproofing problems are covered in standard literature, but there are many special problems which can not be thus adequately discussed. In order to meet these contingencies, a Waterproofing Service Department is maintained at Youngstown to assist in the solution of special problems. Aside from this service which is offered by the Home Office, our branch offices and representatives throughout the country are qualified to render the same assistance.

The Waterproofing Sales Department will be glad to suggest details for waterproofing or dampproofing any particular structure and will supply instructions and specifications for carrying on the work, provided that data is supplied describing conditions to be met. Our engineers will study the problems and recommend the best methods and materials. This service is free and does not obligate you in any way.

Quality of GF Waterproofing Products

GF Waterproofings are manufactured from chemicals of the highest grade procurable and will accomplish as much as any similar product that can be found on the market.

Literature

THE GENERAL FIREPROOFING COMPANY publishes a wide variety of literature on waterproofing, from pieces describing the entire line to small folders discussing the use of an individual product for an individual purpose.

GF Integral Waterproofing Paste No. 10

A smooth, white paste to be mixed with the gauging water of concrete. The small quantity required and the ease of using it make it an effective and inexpensive waterproofing. Once dissolved in the gauging water used for tempering the mass, it remains permanently in

solution. GF Waterproofing Paste No. 10 is used in densifying and waterproofing 1-2-4 mix concrete, either plain or reinforced. It lubricates the mixture, reduces amount of gauging water necessary to secure density, and thus decreases voids in finished concrete.

Also used to waterproof stucco.

GF Integral Waterproofing Powder No. 11

This product is the same material which forms when GF Integral Waterproofing Paste No. 10 combines with cement in finished concrete or mortar. It is mixed dry with the cement.

GF Cement Accelerator No. 12

A colorless liquid which is mixed with water and used to accelerate the set of cement. It also lowers the freezing point, thereby allowing work in much colder weather than usual; eliminates overtime work, and permits a much better finish to concrete floors. For mass concrete and cement floor work.

GF Foundation Brush Coating No. 16

A bituminous compound which can be applied with a brush to the outside of any foundation wall.

GF Mop Coating No. 17

A high grade bitumen for use with either GF Waterproofing Felt No. 18 or GF Saturated Fabric No. 21 in building up a membrane waterproofing. GF Mop Coating No. 17 is free from all elements which have no permanent waterproofing value. It remains elastic at zero and will not run or slide at 110° Fahr. It repels water, ammonia solutions, hydrochloric acid, sulphuric acid, and saturated solutions of sodium chloride. It must be melted before using and be applied hot.

GF Waterproofing Felt No. 18

For membrane waterproofing in connection with GF Mop Coating No. 17. A strong water repellent felt made up from wool stock with linen and wool fiber to give it tensile strength. GF No. 17 and GF No. 18 in combination are used for waterproofing swimming pools, steel and concrete bridge decks, substructures, etc.

GF Saturated Fabric No. 21

A high grade cotton duck fabric, thoroughly saturated during manufacture, with strictly pure bitumen. For use especially on railroad bridges, etc., where there is a great deal of vibration.

GF Acidproofing No. 99

This product is chemically neutral and will not combine with material over which it is applied. Especially adaptable for coating wood or concrete walls in hospitals and laboratories, and for coating tanks or vats (on the inside) to contain weak acids or alkali mixtures.

GF Colorless Waterproofing No. 100

A colorless, permanent, pore filling liquid which effectively dampproofs walls without changing appearance. For waterproofing exterior walls of brick, stone, or stucco; for copings, parapets, cornices, cisterns, water tanks, pools, etc.

GF Cement and Masonry Coating No. 101

For uses similar to GF No. 100, except that it imparts a lasting color to the surface. Supplied in colors—white, old ivory, buff, bedford gray, portland gray, concrete gray, tile red, and brownstone—making it possible to secure almost any desired decorative effect. GF Cement and Masonry Coating is in no way affected by the alkali in concrete or stucco surfaces and will not peel or scale, as will ordinary paint. It effectively fills and seals surface pores, thus preventing absorption of moisture.

GF Thinner No. 101

A thinner to be mixed with GF Cement and Masonry Coating to form the priming coat. Use 1 part of thinner to every 5 parts of GF No. 101.

GF Metallic Floor Hardener No. 140

A ground metallic hardener which is mixed with cement and dusted over surface of a concrete floor prior to final troweling. Gives a smooth, hard, dense surface that will withstand exceptionally severe traffic.

GF Crystalrox Crystals No. 145

A chemical hardener which increases the hardness of a cement surface from 40% to 50%. Can be applied to old floors without interrupting their use. It protects floors from action of weak acids, alkalis and oils. GF Crystalrox No. 145 is shipped in crystal form, this method being adopted for the customer's greater security. There is no freight charge on the water used to dissolve the crystals. Will keep indefinitely if kept dry.

Application is simple. Dissolve crystals in water and apply solution in accordance with specifications.

GF Floor Enamel No. 155

A product containing high grade pigments combined with a tough, elastic vehicle which insures maximum wearing surface. The proper percentage of pigment and vehicle is combined in order to obtain greatest wear. This enamel gives an even, uniform coating and is especially adapted for cement floors in hospitals, schools, hotels, libraries and all public buildings. GF Floor Enamel No. 155 is furnished in several pleasing colors. Neither pigment nor vehicle is affected by free lime in cement.

GF Floor Enamel No. 155 Transparent (Floor Primer)

When deep penetration of surface is required, it is found advisable to apply a floor primer previous to application of colored floor enamel. This is true of dusting floors or when the floor is laid directly on the ground.

GF Wood Floor Preservative No. 160

For application to either hard or soft wood floors. An exceptionally high grade wood preservative, giving a smooth appearance that is highly wear resistive. Seals pores of the surface to which it is applied, prevents absorption of moisture, prevents dry rot, and cements fibers of the wood together, thus preventing splintering and slivering.

GF Dampproofing Coating No. 200

A material to be applied to interior of brick or tile walls above grade before plastering. It forms a dampproof coating and at the same time furnishes a bond for plaster, inasmuch as the material retains a strong "tack." GF No. 200 is applied with a brush and effectively protects interior plastered surface from absorption of dampness and moisture through wall. GF Dampproof Coating No. 200 is *not* to be applied to ceilings which are later to be plastered. This product is also used as a dampproofing on walls which are furred, lathed, and plastered.

GF Stainproof Stone Backing No. 220

A high grade coating applied to all unexposed sides of cut stone, marble, etc., to prevent staining and discoloration. Effectively seals pores of stone, preventing penetration of moisture and dampness from back-up walls, etc.

GF Black Mastic Cement No. 250

A heavy plastic trowel coating used for waterproofing concrete, tin or slate roofs, also for calking around windows and doors, pointing up flashings, chimneys, roof gutters, etc. Previous to application of GF Black Mastic Cement No. 250, GF Liquid Primer No. 250 shall be used.

GF Liquid Primer No. 250

A brush coating for use previous to the application of GF Black Mastic Cement No. 250.

GF Mastic Cement in Colors No. 250

A heavy decorative mastic trowel coating, pigmented, manufactured for use similar to GF Black Mastic Cement No. 250.

GF Steel Coating No. 300

A high grade paint for coating steel surfaces to protect them from corrosion. Also thoroughly insulates the surface and prevents electrolytic action. Furnished in black and several colors.

GF Galvanized Primer No. 350

For priming galvanized surfaces. Penetrates the film of grease left in the galvanizing process, forming a perfect bond with the metal itself without injuring the zinc coating. Furnished in several colors. To be used previous to the application of a paint.

GF Bonding Compound No. 400

To be diluted with water and used as a wash to increase the bond between old and new concrete or plaster coat.

GF Wood Preservative No. 550

To be used for making structural timbers, posts, etc., proof against the action of water, rotting due to dampness, etc. Applied by brush, spray, or immersion. Nut brown in color.

THE PHILIP CAREY COMPANY

Manufacturers of Waterproofing and Dampproofing Materials

LOCKLAND, CINCINNATI, OHIO

FIFTY BRANCHES AND DISTRIBUTING POINTS IN NORTH AND SOUTH AMERICA AND EUROPE
 FACTORIES: LOCKLAND, OHIO, AND PLYMOUTH MEETING, PA.

Products

CAREY PERCOPROOF DAMPPROOFING.
 CAREY PREFORMED MEMBRANE
 WATERPROOFING SYSTEM.

Also manufacturers of Carey Fabricated Membrane, Carey No. 66 Subway Asphalt, Carey Feltex (Asphalt Saturated Felt), Carey Asphalt Primer, and Carey Anthracoil Wood Preservative.

For Built-up Roofing, see page 142; for Expansion Joints, see page 168; for Pipe Coverings, see pages 530-531.

Experience and Facilities

For half a century this company has manufactured various waterproofing and damp-proofing materials and has evolved improved methods for their successful application. The fact that these materials are today serving the purpose for which they were installed and intended is definite and convincing proof of the reliability, permanence, economy, and satisfaction, which the users of Carey products know are their characteristics.

Carey Percoproof Dampproofing

Cost, covering capacity, efficiency, durability and safety attending the use of a dampproofing material are the vital factors governing its acceptance and use.

Percoproof is a black liquid material carefully and uniformly made by the fusion of select waterproofing gums. It comes to the job ready for use, involving no additional cost for its preparation.

Its covering capacity averages about 100 sq. ft. per gallon, depending somewhat on the condition of the surface to be covered.



Carey Preformed Membrane System of Waterproofing

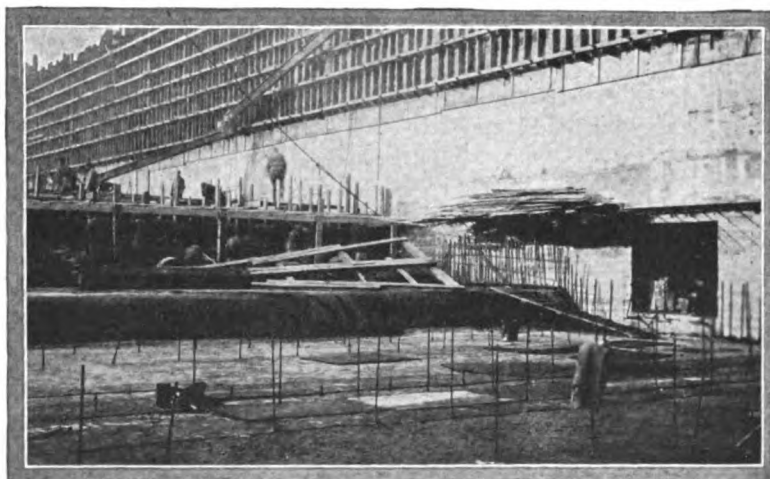
The Carey preformed membrane system of waterproofing was developed from the well recognized need of providing an efficient volume of real waterproofing without the tremendously excessive labor cost incident to such construction by old methods of laboriously building up to the required thickness. Since asphalt, rather than felt, is the real waterproofing material, a heavy body of asphaltic compound is interposed between two layers of asphalt saturated wood felt, combined to uniform thickness under tremendous mechanical pressure, providing a heavy barrier impenetrable to moisture and positively resistant to seepage.

Made in standard sheets 3x5 ft., 1/4 and 1/2 in. in thickness, furnished complete with all materials for installation.

Indorsement—Experienced engineers who have used this system on large and important works have pronounced it absolutely the most satisfactory and efficient ever installed.

Installations—The following installations are but a few representations of the type and characters which afford complete satisfaction to all users:

Cheswick Power Plant, Cheswick, Pa.
 Harrison Water & Electric Co., Harrison, Ohio
 Rapid Transit Subway Stations, Cincinnati, Ohio



WATERPROOFING UNDER TURBINE ROOM OF THE CHESWICK POWER COMPANY

Correspondence

Correspondence regardless of the size or character of any project or problem involving waterproofing or dampproofing, is invited. The combined experience of our experts and engineers under varied conditions in all parts of the country affords a fund of information which is frequently of an invaluable character.

HYDREX ASPHALT PRODUCTS CORPORATION

Manufacturers; Engineers and Contractors in Waterproofing

170 Broadway
NEW YORK, N. Y.

BRANCH OFFICES

CHICAGO, ILL.

PHILADELPHIA, PA.

WASHINGTON, D. C.

ATLANTA, GA.

Products

HYDREX WATERPROOFING FELT (Penna Special Grade), coated, prevents charring from hot applications; HYDREX COMPOUND, a tough, acid resisting bitumen of various melting points; HYDREX MASTIC COMPOUND, acid-proof, for battery room, laboratories and chemical floors; "MEMBRANE METHOD" (HYDREX) BUILT-UP ROOFING; HYDREX PAINT, for dampproofing interior and exterior walls, above and below grade.

Also, Hydrex Preservative Paint (metal coating, electrical work, sulphuric acid resisting), Waterproof cloth, Waterproof Fabric, Waterproof burlap, Saniflor (sanitary sound deadening felt), Novento (triple coated sheathing felt) and Ready Roofings.



TRADE-MARK

pressure work) above and below grade. *Material and method go together.* This is the secret of the Hydrex success.

Hydrex Waterproofing Felt—A saturated impervious sheet *coated* on both surfaces like enamel leather. This impervious sheet (like hide or leather) when cemented together in four or more layers with Hydrex Compound (a bitumen as elastic as the felt) forms the well-known thick, tough, insulating, flexible, watertight Hydrex "Membrane Method" of Waterproofing and Roofing, which has been used in many millions of dollars worth of international work, and has excelled in every competitive test. *These are facts of record.*

Our pamphlet—"The Waterproofing of Solid Steel Floor Railroad Bridges"—gives further cloth, fabric, burlap, mastic, asbestos and coated felt details.

Waterproofing Efficiency, How Calculated

Ascertain first, not the strength, but the *quantity* in pounds per 100 sq. ft. of actual waterproofing materials (felt and bitumen), and the *thickness* of proposed waterproofing or roofing.

For example: A 2-layer stratum of cloth or fabric is 100% less in *thickness* and in pounds of actual waterproofing materials than a stratum of 4 layers of felt, yet the 2 layers cost more than the 4 because of higher price of cloth or fabric and greater labor in applying it. The thicker stratum is, of course, much greater in durability than the thinner.

Therefore, the first essential is not strength, but *waterproofing in the mass*. Mass means thickness—thickness means durability, greater insulation, and a greater factor of safety against leaks.

The strength idea in waterproofing is an attractive fallacy, which seems plausible, because usually accepted without question or investigation. Analyze it. For example: Strength in waterproofing, *per se*, will not hold concrete together or prevent it from splitting. Flexibility in the *asphalt* (which should not become hard or brittle) is more important than strength in the cloth. Test the watertightness and porosity of cloth or fabric as compared to a waterproof *coated* felt. Again, it is the general practice to use, in built-up roofing (always open to view and renewal), from 4 to 5 layers of felt. To use in below-grade waterproofing, which can not be replaced, *only* 2 layers of cloth or fabric, is a complete reversal of practice. Logically, double the quantity used on a roof should be used in buried waterproofing.

"Membrane Method" (Trade-marked) of Modernized Waterproofing

As manufacturers of waterproofed cloth, fabric, burlap and felt it matters not to us, from a sales standpoint, whether one or the other product is sold. But from a technical and waterproof engineering standpoint we can recommend only that, which after many years' practical experience, we believe best suited for the special purpose. There is a great difference between reinforcing concrete with open wire mesh and reinforcing asphalt, in the waterproofing sense, with open mesh, non-waterproof cloth or fabric—the current cloth being now very open mesh. This practice reverts to mastic, burlap and similar waterproofing methods tried out and failed long ago, especially for water pressure conditions.

The "Membrane Method" (Hydrex) or the Hydrex, Method of Waterproofing and Roofing, is based on both material and method. For nearly 20 years it has been yielding to cracks in concrete and serving successfully in roofing and waterproofing (especially in water

Comparisons of Waterproofing and Roofing Methods Actual Waterproofing in Lbs. per 100 Sq. Ft.—

"MEMBRANE METHOD" (Trade-marked) SPECIFICATION	CLOTH OR FABRIC SPECIFICATION
4 layers Hydrex Felt Penna Special	2 layers cloth or fabric
5 layers Hydrex Compound	3 layers asphalt
Weight of actual waterproofing	Weight of actual waterproofing

"Membrane Method" vs. Integral Regarding Electrolysis—The following conclusions are from the report (after nine years' work) of the Committee on Waterproofing Materials as adopted by the Am. Soc. T. M.:

(a) The integral or cement method can not waterproof against cracks.

(b) And can not protect and insulate against electrolysis.

Our Hydrex "Membrane Method" (trade-marked) Waterproofing is a perfect non-conductor against electric currents. See our pamphlet, "Insulation of Concrete Against Electrolysis."

Greater Waterproofing Efficiency of "Membrane Method" Roofing

"Membrane Method" (*trade-marked*) Roofing furnishes greater waterproofing efficiency because it eliminates the use of slag or gravel and provides a roof of maximum waterproofing efficiency at a minimum weight.

The elimination of the dead weight in the surfacing of gravel (usually used as a covering for coal tar roofs) is an added feature of safety in the roof by minimizing the danger of its collapsing under heavy dead loads of snow and ice; also the damage often caused by the gravel clogging drains.

Acidproof and Waterproof Mastics for Floors

Hydrex Compound is standard for acidproof mastic for floors in battery rooms, laboratories, chemical plants, sugar refineries, etc. Specify Hydrex Compound "B" Grade 1-3. Special data furnished.

Hydrex Paint

For dampproofing walls, electrical work, etc.

THE HYDROLITHIC WATERPROOFING CO., INC.

Engineers and Contractors for Waterproofing

TELEPHONE
BOWLING GREEN 5055

32 Pearl Street
NEW YORK, N. Y.

Services and Products

Engineers and Specialists for WINSLOW'S
HYDROLITHIC SYSTEM OF WATERPROOFING.

This company takes and executes contracts for the WATERPROOFING of all kinds of SUBSTRUCTURES, such as Subways, Tunnels, Reservoirs, Vaults, Swimming Pools, Boiler Rooms, Cellars, etc., giving a guarantee against any percolation, whether structures are of concrete, brick or stone.

Winslow's Hydrolithic System

All work is executed in the well-known Winslow's hydrolithic system, using either hydrolithic cement or hydrolite as the conditions may require. Hydrolithic coatings contain all the good points of a first class true portland cement mortar, with the addition of their water repellent and waterproofing qualities.

Application—Hydrolithic waterproofing is applied on the interior of exterior walls and floor forming one monolithic shell. Its adhesive qualities are such that it will withstand any water pressure, and will last just as long as the structures waterproofed will last. Hydrolithic waterproof coatings, $\frac{5}{8}$ in. thick on brick, have withstood tests of 1200 lbs. per sq. in.; and actual successful work has been done 162 ft. below grade, representing a hydrostatic pressure of over 70 lbs. per sq. in.

Advantages—The advantages of Winslow's hydrolithic system over the old membranous method are many: Repairs of any defects can be made easily, as the work is always in sight; it gains floor space, taken up in the membranous method of protecting brick walls, not necessary under the hydrolithic system; the waterproof coat constitutes the finish of the walls and floors and, being impervious, is absolutely sanitary. Hydrolithic coatings are perfectly bonded to waterproofed structures, forming a part of such and thereby add strength to walls, and especially to floors.

Record—Winslow's hydrolithic system has been used for more than 25 years; has stood the test of time, and the company can truly say there is nothing superior to it on the market to-day.

Estimates—If architects will write their requirements, specifications and estimates will be gladly furnished, no matter how large or small the job may be.

HYDROLITHIC

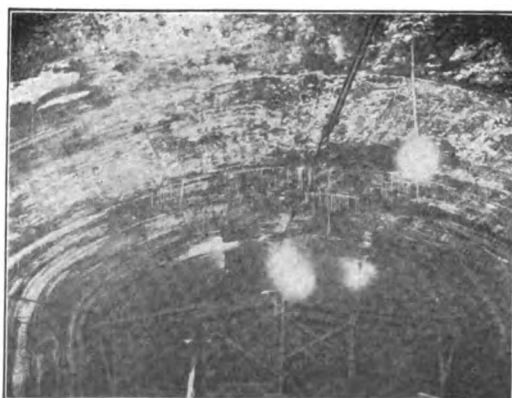
TRADE-MARK

References

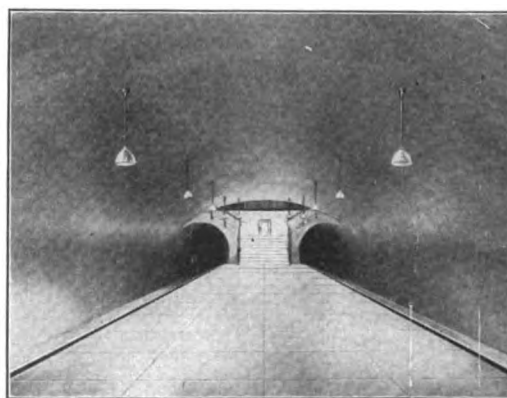
A few of the buildings where Hydrolithic

Waterproofing was installed:

Graton & Knight Mfg. Co., Worcester, Mass.
Third National Bank, Springfield, Mass.
Scovill Mfg. Co., Waterbury, Conn.
Bridgeport Trust Co., Bridgeport, Conn.
Standard Oil Co., Baltimore, Md.
Public Service Building, Baltimore, Md.
Gambrill Mfg. Co., Ellicott City, Md.
Grace Dodge Hotel, Washington, D. C.
William Penn Hotel, Pittsburgh, Pa.
Mellon National Bank, Pittsburgh, Pa.
National Biscuit Co., Pittsburgh, Pa.
Jos. Horne Co., Pittsburgh, Pa.
Standard Underground Cable Co., Pittsburgh, Pa.
University of Pittsburgh, Pittsburgh, Pa.
Pressed Steel Co., Wilkes-Barre, Pa.
Pittsburgh Plate Glass Co., Ford City, Pa.
Royster Building, Norfolk, Va.
Interstate R. R. Co., Norton, Va.
Farmers Supply Co., Roanoke, Va.
B. F. Goodrich Co., Akron, Ohio
Peoples National Bank, Jackson, Mich.
Michigan City Trust & Savings Bank, Michigan City, Mich.
First Church of Christ, Scientist, Louisville, Ky.
Royal Bank of Canada, Liverpool, Nova Scotia
Standard Oil Building, New York, N. Y.
College of City of New York, New York, N. Y.
Glackner Building, New York, N. Y.
Nurses Club, New York, N. Y.
Fifth Avenue Building, New York, N. Y.
Manhattan Eye & Ear Hospital, New York, N. Y.
Remington Typewriter Co., New York, N. Y.
Residence, R. Fulton Cutting, New York, N. Y.
Residence, Jas. Gamble Rogers, New York, N. Y.
New York Harbor Dry Dock Co., Staten Island, N. Y.
Pittsburgh Plate Glass Co., Long Island City, N. Y.
Goodyear Tire & Rubber Co., Long Island City, N. Y.
Loft Candy Factory, Long Island City, N. Y.
Ardsley Club, Ardsley, N. Y.
Sunningdale Country Club, Scarsdale, N. Y.
Piping Rock Club, Locust Valley, N. Y.
New York Shipbuilding Corp., Camden, N. J.
Victor Talking Machine Co., Camden, N. J.
Westinghouse Lamp Co., Trenton, N. J.
U. S. Post Office, Asbury Park, N. J.
Singer Mfg. Co., Elizabethport, N. J.
Geo. J. Gould Estate, Lakewood, N. J.
Norwood Golf Club, Long Branch, N. J.



Before applying Waterproofing



After being Waterproofed

42ND STREET (NEW YORK) STATION, QUEENSBORO SUBWAY

THE RUBEROID CO.

Waterproofing Materials and Compounds

95 Madison Avenue
NEW YORK, N. Y.

GENERAL OFFICES

BOSTON, MASS.

CHICAGO, ILL.

SAN FRANCISCO, CAL.

MONTREAL, QUE.

Products

RUBEROID CEMENT-WATERPROOFING.

Also, Ruberoid Weatherproofing Products, including Roll Roofings, Shingles, Waterproofing Felts, Insulating Papers, Paints, Enamels, Varnishes and Asphalt Specialties.

Ruberoid Cement-waterproofing

Ruberoid Cement-waterproofing is used for waterproofing and oilproofing. It makes the most impermeable mortar known to science. It will resist an enormous water pressure and will hold gasoline and even compressed air.

A mortar facing containing Ruberoid Cement-waterproofing, plastered on the *inside* of a structure, according to Specification A, will resist successfully a 100-ft. head of water coming from the outside. It *water-proofs with a high factor of safety* and adheres to new or old surfaces. Nothing will pry it loose. Age improves its quality.

Ruberoid Cement-waterproofing is a white paste having a bituminous base, emulsified so as to be mixable with water. Unlike compounds containing calcium-stearate or other soap, it does not reduce the strength of mortar, or delay the set. Therefore, larger amounts can be used and greater safety attained, although even for equal weights it will be twice as efficient.

Ten years practical success, as well as conclusive technical facts, await your investigations.

Lean Mixtures Now Possible—The efficiency attainable with Ruberoid Cement-waterproofing, permits using a lean mortar, no matter how severe the waterproofing requirements.

It has been known for years that lean mortar is strong enough for plastering and does not crack, whereas rich mortar does crack. Lean mortar, however, is naturally porous, so the designer was in a dilemma until the advent of Ruberoid Cement-waterproofing.

The fact is that cement acts like wood, swelling on wetting and shrinking on drying. This is the chief cause of cracking. Sand is not affected; therefore, the more sand in the mortar, the less will be the cracking.

Considering these points, it is obvious that the choice of mortar depends on its exposure to drying influences. The following specifications are confirmed by many years of experience. Where richer mortars are used, cracks result sooner or later. Full specifications on request.

Specifications

Abridged Specification A (1:3 Mortar)—Walls and floors, where indicated on plans or specifications, are to be waterproofed with 1:3 cement mortar, containing 12 lbs. of Ruberoid Cement-waterproofing, per bag of cement, as per Specification A of THE RUBEROID CO., New York, whose guarantee must be secured by the contractor before starting work.

Note: 1:3 mortar should be used for cellars, pits, tunnels, tanks, etc., where artificial heat, circulation of air or other drying tendency may occur. It is also used for fountain and swimming pools because these are occasionally emptied and may be exposed to the sun.

Ruberoid Cement-waterproofing can be guaranteed, when applied according to Specification A. Full particulars on request. Our co-operation in the design and execution of the work leads to greater economy and safety.

Specification A contains the most advanced practice and original details. It takes more compound than competitors are able to use and gives twelve times the effectiveness, which insures success under the most adverse conditions. It calls for a lean mortar which prevents cracks. The actual cost of the compound used is about 5c per sq. ft.

Abridged Specification B (1:2 Mortar)—Walls and floors, where indicated on plans or specifications, are to be waterproofed with 1:2 cement mortar, containing 2 lbs. of Ruberoid Cement-waterproofing per bag of cement, as per Specification B of THE RUBEROID CO., New York.

Note: 1:2 mortar can properly be used for underground tanks, pits, etc., which are continually in contact with moisture and where no heat or circulation of air is possible.

Abridged Specification C (1:2:4 Mass Concrete)—Concrete, where indicated, is to be 1:2:4 mix, containing 1 lb. of Ruberoid Cement-waterproofing per bag of cement, as per Specification C of THE RUBEROID CO., New York.

Abridged Specification D (1:4 Mortar)—Mortar, where indicated, is to be 1:4 mix, containing 4 lbs. of Ruberoid Cement-waterproofing per bag of cement, as per Specification D of THE RUBEROID CO., New York.

Note: 1:4 mortar should be used for stucco, roofs and other surfaces exposed to the weather and not in contact with moist earth.

THE TRUSCON LABORATORIES

Waterproofings, Technical Paints and Factory Maintenance Products
DETROIT, MICH.

BRANCH OFFICES

ATLANTA, GA., 605 Forsyth Building
BOSTON, MASS., 147 Summer Street
CHICAGO, ILL., 22 West Monroe Street
CLEVELAND, OHIO, 13434 Merl Avenue
COLUMBUS, OHIO, 261 Taylor Avenue
DENVER, COLO., 2941 Walnut Street
DETROIT, MICH., 120 Witherell Street
EL PASO, TEX., 1701 Olive Street
INDIANAPOLIS, IND., 604 City Trust Building
MINNEAPOLIS, MINN., 601 Metropolitan Building
NEW YORK, N. Y., 110 West 40th Street

NORFOLK, VA., 607 Dickson Building
OMAHA, NEBR., 100 North 18th Street
PHILADELPHIA, PA., 814 Commonwealth Building
PITTSBURGH, PA., 916 House Building
PORTLAND, ORE., 194 North 13th Street
ST. LOUIS, MO., 1307 Syndicate Trust Building
SALT LAKE CITY, UTAH, 424 McIntyre Building
SPOKANE, WASH., 527 Old National Bank Building
SAN FRANCISCO, CAL., 10th and Bryant Streets
SYRACUSE, N. Y., 440 Gurney Building
TORONTO, ONT., 34 Victoria Street

Products

WATERPROOFINGS, and FACTORY MAINTENANCE PRODUCTS: Dampproofings, Preservatives, Floor Hardeners, Technical Paints.

Truscon Waterproofing Paste, Concentrated

Integral waterproofing compound, in paste form for concrete and cement mortar; mixes perfectly with water and diffuses readily through the mix, giving uniformly dependable results.

For foundations, dams, tunnels, reservoirs, tanks, and floors where absolute waterproofness is essential.

Specifications—Mass Concrete—The dry mix of cement, sand and stone (1:2:4) to be tempered with water to medium consistency and add 1 part Truscon Waterproofing Paste, Concentrated, to each 36 parts of water as per manufacturer's directions. All concrete to be placed in one continuous operation, each pouring to be thoroughly spaded to insure uniform density.

Waterproof Plaster Coat Applied to Concrete or General Masonry—To dry mix of sand and cement (2:1), tempered to required consistency, add 1 part Truscon Waterproofing Paste, Con-

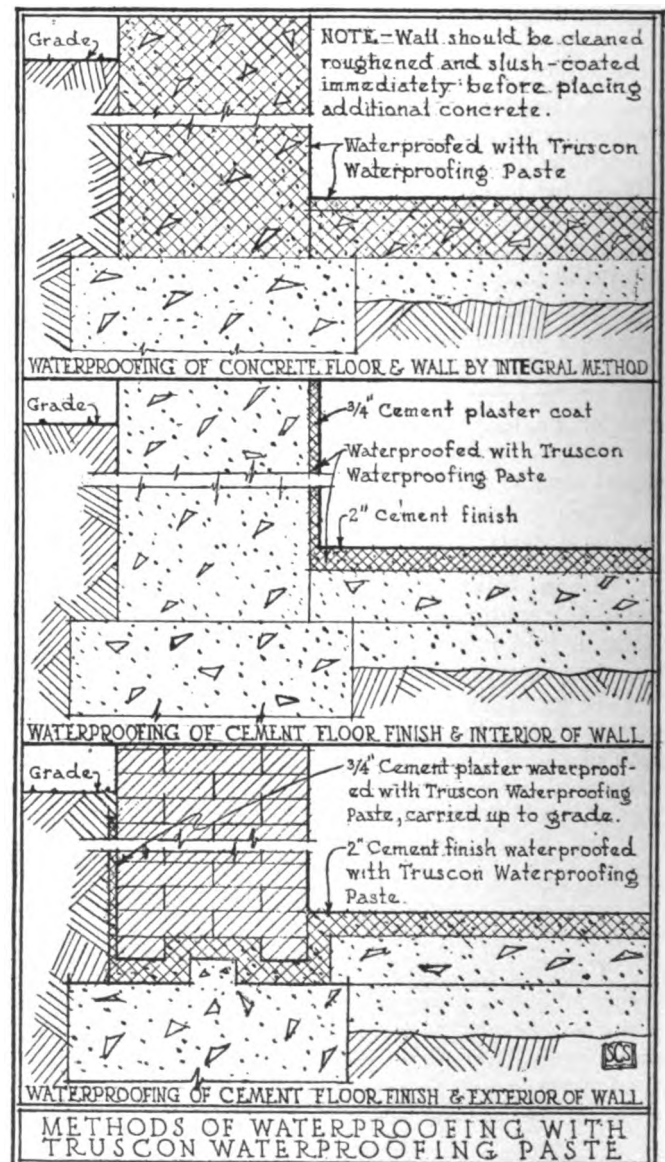
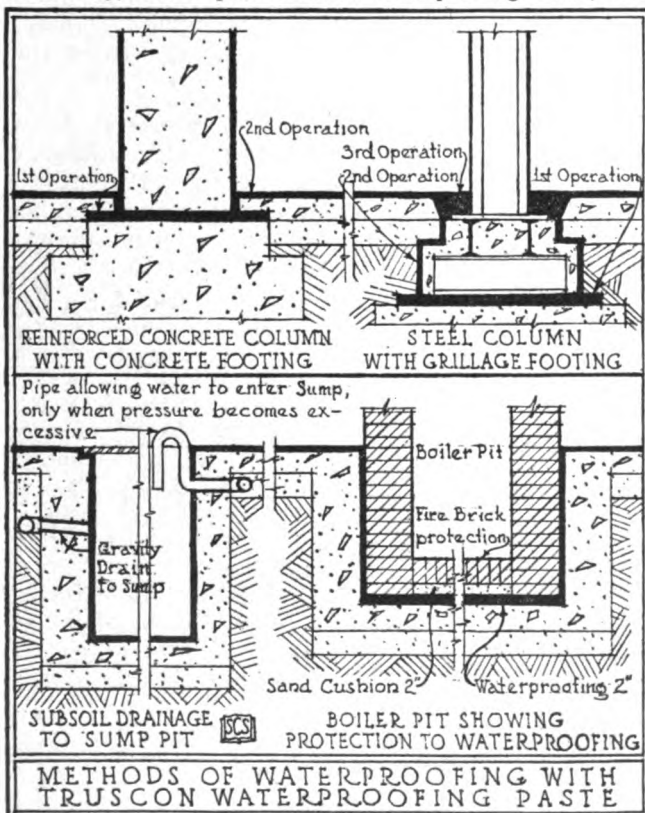


TRADE-MARK

centrated, to 18 parts of water as per manufacturer's directions. Before applying waterproofing coat, chip or otherwise roughen up the masonry and thoroughly clean to afford satisfactory bond. Further treatment of such surfaces as directed by manufacturer.

Plaster to be applied in 2 coats, each $\frac{3}{8}$ in.; the second applied just before the first has reached its final set.

For detail specifications see "Structural Waterproofing," furnished free on request.



TRUSCON MAINTENANCE ENGINEERING SERVICE

MAINTENANCE DEPARTMENT TRADE-MARK

A Maintenance Product for every Maintenance Purpose

Every manufacturing plant, office building, hotel, hospital, apartment block, etc., has a definite problem in its maintenance and upkeep. Interiors must be painted and protected against deterioration and there is much varnishing and cleaning to be done.

On account of the exceptional manufacturing facilities of THE TRUSCON LABORATORIES and our experience in handling such maintenance requirements, we are in a position to offer every engineer, architect, building or plant superintendent a valuable service.

On this page we enumerate a few standard Truscon products and their particular uses. These are suggestive and we ask that you bear in mind that Truscon maintenance engineering service does not merely furnish maintenance materials, but is a service which extends

an intelligent, co-operative assistance that results in money saved on your maintenance requirements.

Concrete Floors Hardened Chemically—with Agatex—Agatex hardens and densifies the cement, making it dustless, oilproof and long-wearing. Send for booklet "Agatex and Its Performances."

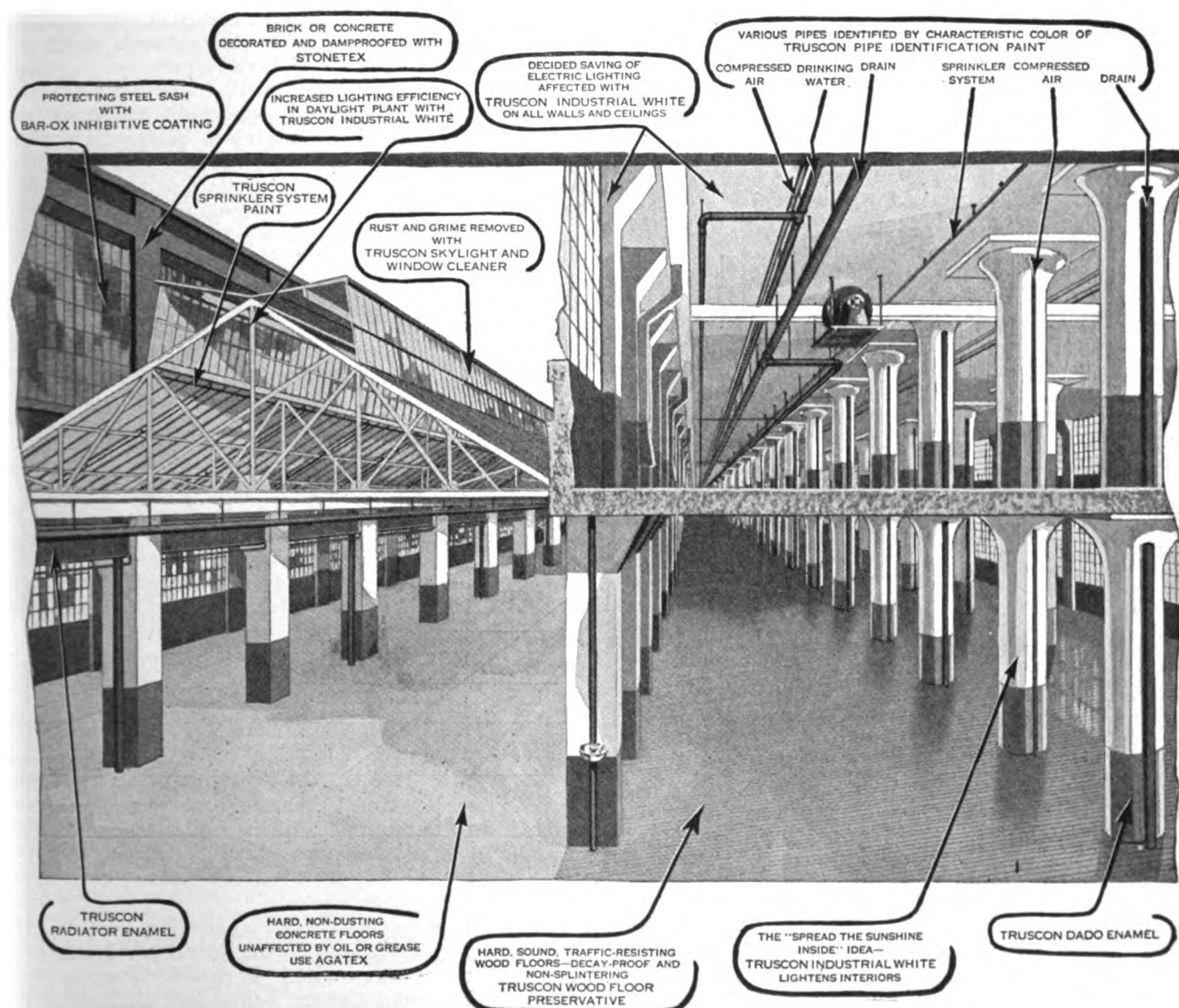
"Daylighting" Interiors—For increasing the lighting efficiency of a plant use Truscon Industrial White. Send for booklet "Spread the Sunshine Inside."

Identification of Pipes—Truscon Pipe Identification Paint in various standard shades for the various pipes in industrial plants. Send for color card.

Masonry Protected and Dampproofed—Stone Tex, the specialized coating for dampproofing, protecting and beautifying concrete, stone, stucco, etc. Color card on request.

Structural Steel, Steel Sash Construction; Tanks and Other Exposed Steel Work Protected—Send for booklet "Bar-Ox Protective Steel Coatings," explaining the electrolytic theory of corrosion.

Wood Floors—Prevent drying-out and splintering of wood floors with Truscon Wood Floor Preservative. Penetrates into the wood. Does not make the surface slippery. Protects against decay where floors are subjected to wetting. Booklet on request.



ILLUSTRATING TRUSCON MAINTENANCE ENGINEERING SERVICE

THE SANDUSKY CEMENT CO.

Manufacturers of Concrete Waterproofing and Waterproofed Cement
CLEVELAND, OHIO

BAY BRIDGE, OHIO

FACTORIES
DIXON, ILL.

YORK, PA.

Products

MEDUSA WATERPROOFING, the original *integral* concrete Waterproofing in either Paste or Powder form.

MEDUSA PORTLAND CEMENTS: Gray and White Portland Cements; Waterproofed Gray and Waterproofed White Portland Cements.

Also manufacturers of Medusa Waterproof Cement Paint, a permanent cold-water paint for all concrete or masonry surfaces and for steel work.

Medusa Waterproofing

What Medusa Waterproofing Is—Medusa Waterproofing (powder) is a water-repellent compound of fatty acids chemically combined with lime, to be mixed dry with the cement and sand before water is added, using from 1½% to 2% of weight of cement (6 to 8 lbs. to 1 bbl. cement).

Medusa Waterproofing (paste) is a white emulsion to be dissolved in the gauging water for the mortar or concrete. Especially recommended for machine mixed concrete. Use 1 gal. (8 lbs.) to 1 bbl. of Portland cement.

Powder and paste are identical in resulting composition; their effect is as everlasting as concrete itself. Ordinary concrete is very porous, containing 20% or more of voids, pores, or small capillary tubes, which readily absorb water and permit in many cases this water to permeate or flow through the concrete. Medusa Waterproofing deposits on the walls of the pores of the concrete a water-repellent lining, preventing water absorption and rendering the concrete dampproof, waterproof and impermeable.



Typical Uses for Medusa Waterproofing—Concrete basement walls and floors, mortar for setting and backing marble, stone, tile, cement blocks, etc., and all similar work can be inexpensively and positively made waterproof and dampproof by the addition to the concrete in mixing of Medusa Waterproofing. Concrete reservoirs, water towers and tanks, bathing pools, tunnels, disposal plants, pumping stations, elevator pits, cisterns, etc., rendered watertight by the use of Medusa Waterproofing are conclusive proof of its efficiency.

How Medusa Waterproofing Makes Concrete Impervious—

(a) The presence of Medusa Waterproofing in the cement does not affect color, strength, or setting of concrete. It prevents white efflorescence. It minimizes shrinkage cracks. Being sealed within the pores of concrete, and not subject to depreciation, the effect is permanent. Adds little to cost and needs no renewal.

(b) In stucco construction the use of Medusa Waterproofing with the cement protects metal lath against corrosion, which may otherwise occur if cement plaster allows moisture to penetrate.

(c) Medusa Waterproofing causes concrete walls, caststone, etc., to dry off immediately after rains, avoiding the unsightly dark appearance which water-soaked concrete retains for hours.

(d) Medusa Waterproofing resists oils and most acids as effectually as it resists water. It is invaluable for storage tanks and vats in refineries, chemical factories, industrial plants, etc.

Medusa Waterproofed Cements—White and Gray

We produce standard "Medusa" Stainless White Portland Cement, and "Medusa" Gray Portland Cement, with Medusa Waterproofing already added in exact proportions. We recommend the purchase of *Waterproofed* Medusa Cement—wherever positively dampproof results are desired—for the following reasons:

(a) Cement and waterproofing are combined in the correct proportions to assure permanently moisture tight cement work, saving time and eliminating the possibility of trouble on the job.

(b) Cement and waterproofing are thoroughly ground in together at the mill. Thorough mixing is essential; purchase of Medusa Waterproofed Cement is added assurance of satisfactory results.

(c) Waterproofed Medusa Cements will not cake nor acquire "pressure-pack" in storage, even when exposed to considerable atmospheric dampness.

(d) The cost is substantially less than that of plain cement and waterproofing bought separately.

Medusa Waterproofed Stainless White Cement—Waterproofed Medusa Stainless White Portland Cement is especially suitable for exterior or interior use wherever a permanent white is desired. By the addition of mortar colors delicate shades and tinted effects are easily secured. It is largely used in stucco, precast building trim; tiling; lining for swimming pools, indoor and outdoor; mortar for setting brick, marble, terracotta, tile, stone, refinishing or "overcoating," etc.

Medusa Waterproofed Gray Portland Cement—For all cement construction such as basement floors, foundation and upper walls, chimneys, etc.; elevators, reservoirs, silos, vats and tanks; and for concrete work of any kind where it is desired to exclude moisture permanently, specify and use Medusa Waterproofed Gray Portland Cement.

This product will give positively dampproof results. Even in basement excavation in quick-sand, where water rises around the walls outside, permanent results can be had by using Medusa Waterproofed Gray Cement—a match may be struck on the inner walls.

Specifications

Use Medusa Waterproofing in the proportions of 2 lbs. of Waterproofing to the sack of cement, or 8 lbs. per bbl.; bulk 2% waterproofing and 98% cement.

Booklet containing "Manufacturer's Specifications" will be sent to any address.

Guaranteed to Pass U. S. Government Specifications

Medusa Portland Cements are guaranteed to pass the Standard Specifications of the American Society for Testing Materials and the United States Government Specifications. Laboratory tests furnished on request.

Literature

Illustrated booklets, fully explaining the uses of Medusa Stainless White Cement, Medusa Waterproofing, Medusa Waterproofed Portland Cements and Medusa Waterproof Cement Paints, will gladly be sent on request.



TRADE-MARK

THE WATERPROOFING COMPANY

Engineers and Contractors for Waterproofing

345 East 33rd Street
NEW YORK, N. Y.

BRANCH OFFICES

BOSTON, MASS., 65 Albany Street

PITTSBURGH, PA.

Product and Services

Manufacturers of "COW BAY" WATER-PROOF CEMENT.

Engineers and Contractors for WATER-PROOFING, making a specialty of CEMENT WATER-PROOFING. This company contracts for the waterproofing of basements, subways, reservoirs, vaults, tunnels, swimming pools, etc., guaranteeing a positive and permanent waterproofing for all kinds of masonry construction.

Designs and Builds REINFORCED CONCRETE CONSTRUCTION, including OIL STORAGE TANKS.

Specializes in OILPROOF CONCRETE TANKS.

Experience

THE WATERPROOFING COMPANY introduced and perfected cement waterproofing. During the past 18 years this company has waterproofed a majority of the important buildings in New York, Boston and Pittsburgh.

"Cow Bay" Waterproof Cement

Advantages of "Cow Bay" Waterproof Cement—

No extra supporting walls required. Walls are left with a neat finish; no furring and plastering being necessary. Floor coatings serve both as waterproof seal and floor finish. "Cow Bay" waterproof cement is as hard as the best portland cement, and is placed beneath grillages and column bases without danger of settlement.

Specifications—Material—All interior surfaces of all exterior walls and upper surface of concrete floor slab throughout basement (or subbasement), elevator pits, machinery foundations, trenches, etc., as shown on plans, shall be waterproofed with "Cow Bay" Waterproof Cement, applied by THE WATERPROOFING COMPANY.

Workmanship—All surfaces, before application of waterproof coating, shall be thoroughly chipped and cleaned, and coating applied not later than 24 hours after surface has been so prepared. A perfect bond must be secured with underlying masonry. Wall coating shall be $\frac{3}{8}$ -in. thickness, applied in 2 coats, floated and troweled to a smooth and even finish, free from imperfections. Floor work shall be 1-in. thickness, and is to serve the double purpose of a waterproofing agent and wearing surface. Floor coating shall be floated and finished as described for wall coating.

Guarantee—THE WATERPROOFING COMPANY shall furnish written guarantee that all coating placed by them will be waterproof; that during a period of 3 years after completion of the waterproofing, they will promptly repair any leaks appearing through their work which are not due to causes beyond the waterproofer's control.



TRADE-MARK
Reg. U. S.
Patent Office

A Few Important Waterproofing Contracts—Building, location and name of architect:

Federal Reserve Bank, New York, N. Y., Yorke & Sawyer
Woolworth Building, New York, N. Y., Cass Gilbert
Singer Building, New York, N. Y., Ernest Flagg
Hudson Terminal Buildings, New York, N. Y., Clinton & Russell
American Telephone & Telegraph Co., New York, N. Y., Wm. Welles Bosworth
Morgan & Co., New York, N. Y., Trowbridge & Livingston
Stock Exchange, New York, N. Y., Trowbridge & Livingston

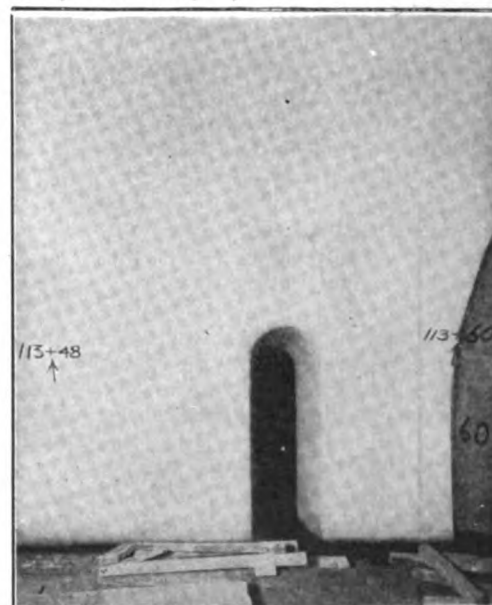
City Investing Building, New York, N. Y., Francis H. Kimball
Adams Express Co., New York, N. Y., Francis H. Kimball
Municipal Building of New York, N. Y., McKim, Mead & White
Guaranty Trust Building, New York, N. Y., Yorke & Sawyer
Liggett Building, New York, N. Y., Carrere & Hastings
State Education Building, Albany, N. Y., Palmer & Hornbostel
Copley Plaza Hotel, Boston, Mass., Henry J. Hardenbergh
Federal Reserve Bank, Boston, Mass., R. Clipston Sturgis
Wentworth Institute, Boston, Mass., Peabody & Sterns
R. H. Stearns Building, Boston, Mass., Parker, Thomas & Rice
Opera House, Boston, Mass., Wheelwright, Haven & Rice
New John Hancock Building, Boston, Mass., Parker, Thomas & Rice; (F. A. Waldron, New York, Engineer)
Shawmut National Bank, Boston, Mass., Parker, Thomas & Rice
Merchants National Bank, Boston, Mass., Coolidge & Shattuck
Old Colony Trust Company, Boston, Mass., Coolidge & Shattuck
Noyes-Buick Company, Boston, Mass., A. H. Bowditch
Union Bank Building, Pittsburgh, Pa., MacClure & Spahr
Jones & Laughlin, Pittsburgh, Pa., MacClure & Spahr
Fort Pitt Hotel, Pittsburgh, Pa., Janssen & Abbott
Oliver Office Building, Pittsburgh, Pa., D. H. Burnham & Co.
43 Telephone Buildings in various cities, McKenzie, Voorhees & Gmelin

Concrete Oil Storage Tanks

During the past few years, hundreds of concrete tanks for the storage of fuel oil have been constructed and oilproofed by this company.



Before being Waterproofed



After being Waterproofed

SAME POINT IN PENNSYLVANIA TUNNELS BEFORE AND AFTER BEING WATERPROOFED WITH "COW BAY" WATERPROOF CEMENT

WESTERN WATERPROOFING COMPANY

ST. LOUIS, MO.

OFFICES

ST. LOUIS, MO., 1604 Syndicate Trust Building
DETROIT, MICH., 400 Penobscot Building
CLEVELAND, OHIO, 1900 Euclid Building
HARTFORD, CONN., 902 Main Street

NEW YORK, N. Y., 103 Park Avenue
BOSTON, MASS., 27 School Street
PHILADELPHIA, PA., 908 Franklin Trust Building
TORONTO, ONT., 59 Yonge Street

Services

Experts in waterproofing and sell no material. All work is done exclusively under contract and is guaranteed. Contracts are taken for TREATING STRUCTURES OF CONCRETE, BRICK or other MASONRY, whether new or old. Consultation is solicited from engineers and architects when plans are being made, with a view to assisting them in the solution of problems involving WATERPROOFING, OILPROOFING, etc.

Method Used

This system involves the use of Ironite Waterproofing, which is a finely pulverized gray iron containing chemicals. Upon brushing this on the walls with the addition of water, the particles are lodged in the surface pores. Due to the chemicals, rapid oxidation of the iron takes place with the resultant expansion of the iron particles. This swelling completely fills the surface pores and seals them against leakage. Sufficient coatings are applied to thoroughly fill all pores. The early coats make a filling or stuffing for the surface pores, and the succeeding coats form a highly oxidized iron filament. This iron oxide surface is extremely dense and impervious, not alone to the action of water, but also to oils, dilute acids, etc.

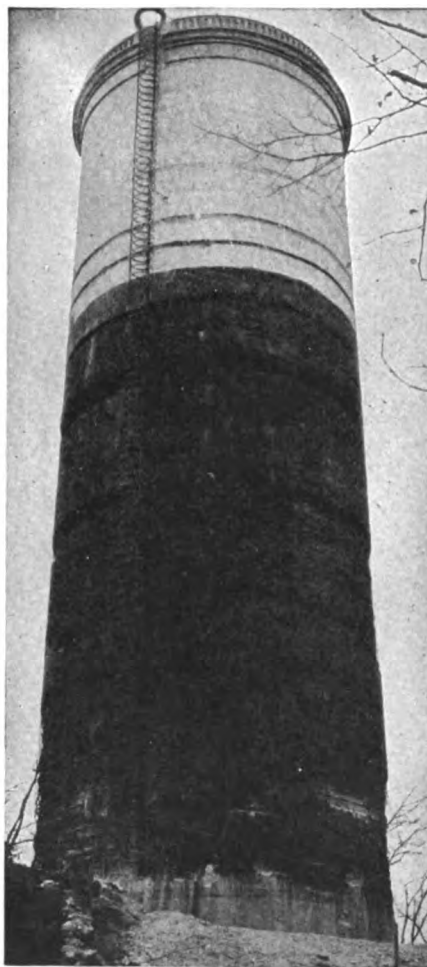
The treatment is applied on either the pressure side or the side opposite. In the latter case it is impossible to force the waterproofing away from the wall as the particles inside the surface pores have expanded therein and become an integral part of the structure.

Character of Work

Waterproofing—Tunnels, powerhouses, subways, pits, swimming pools, reservoirs, dams, retaining walls, viaducts, etc.



TRADE-MARK



STANDPIPE, 105 FT. HIGH, 30 FT. DIAM., CITY OF LEXINGTON, MASS.

Subject to over 100 ft. head water. Waterproofed on inside. Illustration shows concrete being repaired on outside where seepage water froze and forced large pieces of concrete loose

Treatment for—Fuel, oil tanks, gasoline and lighter oils, molasses tanks, pickling vats, mineral or vegetable oil containers.

Acidproofing—To resist soaps, greases, fats, etc.

Treating floors and walls of packing houses, soap factories, tanneries, dairies and other structures requiring protection of concrete and brick against dilute acids.

Protection from Greases, Vegetable Oils, etc.—We have successfully used this system for the protection of concrete and brick walls and floors in packing houses, soap factories, sugar refineries, dairies, etc., but individual specifications are necessary for each job. We solicit inquiries on this class of work.

Specifications

It is our preference to write a separate specification for each specific job. As a general specification the following may be used:

General Specification—All enclosing walls and floors coming in contact with the earth are to be treated on the inside surfaces by the WESTERN WATERPROOFING COMPANY [give here street and town address of nearest office] according to their system of waterproofing, to be covered by their written guarantee.

Waterproofing Completed Structures

Frequently it occurs that at the time of construction dry conditions obtain, but after completion, the structure develops leakage. Owing to our ability to waterproof on the inner surfaces of the building, we are in a position to economically overcome the trouble, and are constantly doing work of this nature.

GENERAL CHEMICAL COMPANY

Chemical Treatments for Concrete

25 Broad Street
NEW YORK, N. Y.

CHICAGO OFFICE, 112 West Adams Street

Product

HARD-N-TYTE: Chemical Surface Hardener and Priming Coat for concrete, portland cement mortar, plaster and stucco surfaces.

Hard-n-tyte

Hard-n-tyte is the trade-name for pure white crystals of zinc and magnesium-fluosilicate. When applied to concrete surfaces according to the simple specification given below, Hard-n-tyte combines with the lime in the cement, producing a hard, insoluble sub-



TRADE-MARK
Reg. U. S. Pat. Off.

stance similar to fluorspar which binds the particles of aggregate firmly together, giving

- (1) A flint-hard, wear-resistant surface.
- (2) Freedom from "dusting."
- (3) High density.
- (4) A non-soluble surface.
- (5) A surface free from uncombined lime, making

Hard-n-tyte an excellent priming coat before painting concrete.

Standard Packages

Hard-n-tyte is packed in barrels containing 325 lbs. net, and in 50- and 10-lb. containers.

Since it is shipped in a dry, crystalline condition and not as a solution, the use of Hard-n-tyte involves a considerable saving in transportation cost.

Five-year Guaranty Bond

The GENERAL CHEMICAL COMPANY will give a five-year Guaranty Bond issued by U. S. Fidelity & Guaranty Company on all jobs in the United States and Canada providing the floor is finished and treated by a contractor approved by the GENERAL CHEMICAL COMPANY in strict accordance with the following specifications.

Hard-n-tyte Specification for Concrete Floor Finish and Treatment

Top mortar shall be mixed in the proportion of 1 sack portland cement to not more than 2 parts of clean, silicious sand or equally durable material, uniformly graded from $\frac{1}{4}$ in. down to that passing a 100-mesh sieve.

Above mentioned materials shall be thoroughly mixed with a minimum of clean water to give a workable consistency. Measured by the *slump test, the slump shall not be greater than 5 in.

*A simple method of determining the proper consistency of concrete is known as the slump test. A tapered conical form of tin or sheet metal $6\frac{1}{4}$ in. in diameter at the bottom, 12 in. high and $5\frac{3}{4}$ in. in diameter at the top is required. After the mortar has been thoroughly mixed, it is placed in the form until flush with the top and compacted by working with a pointed round rod. The form is then lifted, allowing the concrete to settle or slump. After the pile has settled, its height should be measured and subtracted from the original height of 12 in. This figure is the "slump."

Wearing surface shall have a minimum thickness of 1 in. After being rodded off to grade, mortar shall be finished with a wooden float and steel trowel; then a final finish given with the steel trowel. Surface shall be left true to grade and free from depressions or excessive trowel marks.

After surface has hardened it shall be treated with two applications of GENERAL CHEMICAL COMPANY Hard-n-tyte as follows:

First Application: One part of Hard-n-tyte (by volume) dissolved in 13 parts of water.

Second Application: (After first application has dried, but not sooner than 30 minutes.) 3 parts of Hard-n-tyte (by volume) dissolved in 10 parts of water.

Concrete wearing surface shall be at least 48 hours old and broom-cleaned before first application. Solution shall be

*Hard-n-tyte
Specification
Floors*

TRADE-MARK

evenly distributed over area to be treated and all surfaces shall be kept wet with the solution for at least 3 minutes, each application.

After second application has dried, floor shall be kept covered with building paper until all plastering has been completed.

All Hard-n-tyte used shall be delivered in the original packages.

Note: Incorporating the full wording of the specification in order to avoid any misunderstanding is advised.

If an abbreviated specification form is desired, the following is suggested.

Abbreviated Specification

Concrete floors shall be finished and treated in accordance with the Hard-n-tyte specification dated 1921, by a contractor approved by the GENERAL CHEMICAL COMPANY. The contractor shall furnish the GENERAL CHEMICAL COMPANY'S Surety Bond Guaranty for five years.

Hard-n-tyte Specification for Priming Coat

All portland cement plaster and concrete surfaces shall be treated before painting with a priming coat composed of 3 parts of GENERAL CHEMICAL COMPANY Hard-n-tyte, dissolved in 10 parts of water.

Application shall be made when the concrete or plaster is not less than 24 hours old.

Surfaces shall be kept drenched with the solution for at least 3 minutes.

Paint shall not be applied until the Hard-n-tyte treatment has thoroughly dried and in no case before 48 hours have elapsed.

General Directions for Hard-n-tyte

Hard-n-tyte is readily soluble in cold water, but care should be taken that it is thoroughly dissolved before applying.

When measuring Hard-n-tyte by volume for the first applications, use 1 level pail of crystals (measuring loosely) to 13 pails of water. It is a good plan to give a floor all it will take up readily, even going back over porous spots, where absorption is more rapid.

In this manner the surface is made to wear uniformly, irrespective of irregularities in placing the mortar or method of finishing.

L. SONNEBORN SONS, INC.

Manufacturers of Concrete Floor Hardeners and Technical Paints

262 Pearl Street

NEW YORK, N. Y.

FACTORY: AVONDALE, N. J.

Products

LAPIDOLITH, the Liquid Hardener and Dustproof for concrete floors, and Waterproof for concrete walls.

CEMCOAT, a Wall and Floor Coating for concrete, wood, brick, stucco, metal and other surfaces.

FERMO, an Integral Liquid Chemical for the acceleration of the setting and for prevention of freezing of concrete mixtures.

LIGNOPHOL, a Preservative for wooden floors.

HYDROCODE, a Waterproof for foundations and walls.

PARIPAN, an imported Enamel Paint.

Also manufacturers of Structural Steel Paints.

Lapidolith

Lapidolith is an inorganic liquid chemical which renders new concrete floors hard, dustproof, wearproof and watertight. When applied to old concrete floors, Lapidolith will prevent further dusting and disintegration.

This chemical permeates the concrete and renders it as hard as granite.

Lapidolized floors take on a fine surface finish under service and can be easily washed and swept.

Lapidolith prevents the formation of concrete dust, thus saving expensive repairs to machinery, injury to merchandise, etc.

Lapidolized floors are protected against the action of oils, alkalis, most acids and solutions.

The labor cost of applying Lapidolith is negligible.

Covering Capacity of Lapidolith—According to porosity, 1 gal. will cover about 70 to 100 sq. ft.

Directions for application furnished in each case.

Lapidolith Specifications for Concrete Floors—Harden and dustproof all concrete floors with Lapidolith, manufactured by L. SONNEBORN SONS, INC., New York, as per their directions and under their supervision.

Service Work for Lapidolith—This company itself is prepared to apply Lapidolith under the supervision of a service engineer on areas of 20,000 sq. ft. and over.

Users of Lapidolith—The names of prominent users in every line, in any part of the country, will be furnished on request.

Cemcoat for Interior and Exterior Use

Cemcoat is an ideal, enamellike wall and floor coating, in white and colors. Absolutely free from all poisonous ingredients.

LAPIDOLITH
TRADE-MARK

Cemcoat
TRADE-MARK

It forms an even, light reflecting, non-porous surface, which affords no lodgment for dust and can not be injured by soap and water, or even water applied with a hose.

Fermo

Fermo will:

- (1) Accelerate the setting of concrete.
- (2) Prevent concrete from freezing at low temperatures.
- (3) Densify concrete and reduce its permeability.
- (4) Produce a smooth, workable concrete mass which is much more easily troweled than ordinary cement.

Lignophol, the Preservative of Wooden Floors

New floors will be protected from splintering and decay; old floors will be revived and their life prolonged.

LIGNOPHOL
FOR WOODEN FLOORS
TRADE-MARK

Lignopholed floors last longer, are dustless, smooth and sanitary.

Hydrocode

Hydrocode Integral Waterproofing Powder—For concrete foundations, floors, walls, tanks, elevator pits, etc.

Hydrocode Integral Waterproofing Paste—For cement, stucco, mortar, etc.

Hydrocode No. 633—For dampproofing the inner surfaces of outside walls above the foundations.

Hydrocode No. 648—For waterproofing foundations, walls and footings.

Paripan

Paripan Enamel Paint is an imported long oil enamel, as suitable and substantial for *exterior* use, as it is artistic for *interior* application.

Exceptional covering capacity in both density and area.

Gloss, semigloss (eggshell), flat.

Write for General Specification Book.

Further Information

The following material will be sent on request: Booklet, Scientific Test Reports.

Specification booklet covering Lapidolith, also Cemcoat, Hydrocode, Fermo, Lignophol and other Sonneborn products.

Samples; flask of Lapidolith and hardened block of concrete.

THE CONSOLIDATED EXPANDED METAL COMPANIES

GENERAL OFFICES AND WORKS

BRADDOCK, PA.

(In the Pittsburgh District)

SALES OFFICES

NEW YORK, N. Y.

PHILADELPHIA, PA.

PITTSBURGH, PA.

CHICAGO, ILL.

EXCLUSIVE REPRESENTATIVES

BOSTON, MASS., PENN METAL CO.

TORONTO, CAN., BAINES & DAVID, LTD.

DALLAS, TEX., R. J. DE WEEZ CO.

Products

"STEELCRETE" EXPANDED METAL for reinforcing concrete.

Also manufacturers of Beam Wrapping; Metal Lath; Channel Furring; Galvanized Metal Corner Bead; Special Meshes for Lockers, Machine Guards, etc., Rib-mesh Expanded Metal for Lath and for Concrete Reinforcing.

Sectional Area

A 16-ft. long sheet of expanded metal, for reinforcing concrete, can now be obtained with sectional area of 1.00 sq. in. Heretofore this long length and heavy section has been unobtainable. It will reduce cost of placing reinforcing in concrete. Reinforcing meshes range from sectional area of 1.00 sq. in. down to a light section to be used for temperature stresses.

Scope of Use

"Steelcrete" mesh, the oldest and most widely used of concrete reinforcement, is adapted for reinforced concrete work such as floor and roof slabs, sewers, conduits, tanks, highway bridges, culverts, retaining walls, etc.

Description

"Steelcrete" mesh possesses great unit strength and a high elastic limit. It is cold drawn to its mesh shape under enormous speed, being previously covered with oil. This process, together with the use of soft carbon steel, gives uniformity of quality and stiffness.

Tensile strength of the open hearth steel used is from 55,000 to 60,000 lbs. It has an elastic limit of not less than one-half its ultimate strength, an elongation of about 25% in 8 in., and cold bending test of 180°. Ultimate strength of finished product is raised to a value of 70,000 to 80,000 lbs. and elastic limit increased by 100%.

Severe loading tends to close the diamonds, giving fabric a ductility unencountered in any other reinforcement of high elastic limit. It causes compression in concrete in the plane of the steel, and thus reinforces the construction against sudden rupture.

Advantages

As the structure of "Steelcrete" provides a perfect distribution of steel in a horizontal direction, so its stiffness insures a like perfect distribution in vertical direction. There are no waves or warps to be hammered out or to offer an element of weakness.

Due to mesh shape, "Steelcrete" attains a perfect bond in concrete. There is no peeling or scaling of concrete when subjected to heavy loads.

Temperature stresses are guarded against. The form of "Steelcrete" mesh provides positive reinforcement against these known but indeterminate stresses.

"Steelcrete" mesh is used with a unit stress of 24,000 lbs. per sq. in. to develop equal strength with bars at 16,000 lbs. per sq. in. A great saving is effected thereby. Send for our booklet "Expanded Metal vs. Bars."

DECIMAL STANDARDS FOR "STEELCRETE" EXPANDED METAL

Designation of mesh	Size of mesh, in.		Sectional area, sq. in. per ft. of width	Weight per sq. ft., lbs.	Size of standard sheets, ft.in.x ft.in.
	Width of diamond	Length of diamond			
3-13-075	3	8	.075	.27	6-0x 8-0 6-0x12-0 6-0x16-0 6-9x 8-0 6-9x12-0 6-9x16-0 5-3x 8-0 5-3x12-0 5-3x16-0 7-0x 8-0 7-0x12-0 7-0x16-0 6-0x 8-0 6-0x12-0 6-0x16-0 5-3x 8-0 5-3x12-0 5-3x16-0 4-0x 8-0 4-0x12-0 4-0x16-0 7-0x 8-0 7-0x12-0 7-0x16-0 6-0x 8-0 6-0x12-0 6-0x16-0 7-0x 8-0 7-0x12-0 7-0x16-0 6-3x 8-0 6-3x12-0 6-3x16-0 5-9x 8-0 5-9x12-0 5-9x16-0 5-3x 8-0 5-3x12-0 5-3x16-0 4-9x 8-0 4-9x12-0 4-9x16-0 5-9x 8-0 5-9x12-0 5-9x16-0 4-3x 8-0 4-3x12-0 4-3x16-0
3-13-10	3	8	.10	.37	
3-13-125	3	8	.125	.46	
3-9-15	3	8	.15	.55	
3-9-175	3	8	.175	.64	
3-9-20	3	8	.20	.73	
3-9-25	3	8	.25	.92	
3-9-30	3	8	.30	1.10	
3-9-35	3	8	.35	1.28	
3-6-40	3	8	.40	1.46	
3-6-45	3	8	.45	1.65	
3-6-50	3	8	.50	1.83	
3-6-55	3	8	.55	2.01	
3-6-60	3	8	.60	2.19	
3-1-75	3	8	.75	2.74	
3-1-100	3	8	1.00	3.63	

"STEELCRETE" SPECIAL MESHES

Designation of mesh	Size of mesh, in.		Weight per sq. ft., lbs.	Size of standard sheets, ft.in.x ft.in.
	Width of diamond	Length of diamond		
3/4-in. No 18	.43	1.2	.74	3-0x 8-8 6-0x 8-8 6-0x 8-0 4-0x 8-0 5-0x 8-0 4-0x 8-0 6-0x 8-0 4-0x 8-0 2-6x 8-8 0-6x 8-8
3/4-13-25	.95	2	.80	
1 1/4-13-20	1.36	3	.60	
2-13-15	1.82	4	.50	
3/4-in. No. 9	.95	2	1.80	
1 1/4-in. No. 9	1.36	3	1.28	
2-in. No. 9	1.82	4	.90	
Floor Binder	1.82	4	.18	
Beam Wrapper	3.00	.	.20	

Note that in the decimal standard for "Steelcrete" expanded metal, the width is designated as the short way of the diamond and the length is designated as the long way of the diamond.

Co-operation and Literature

We will send the "Steelcrete" Handbook to those who are interested in reinforced concrete. This is a cloth bound 250-page book containing many handy and complete tables for the designing of reinforced concrete slabs and beams.

The Universal Slab Computer is a celluloid slide rule for quick calculation in reinforced concrete. A charge of twenty-five cents is made to cover the mailing charge.

AMERICAN STEEL & WIRE COMPANY

Triangle Mesh and Electrically Welded Concrete Reinforcement

SALES OFFICES

CHICAGO, 208 South La Salle Street
 NEW YORK, 30 Church Street
 WORCESTER, 94 Grove Street
 BOSTON, 185 Franklin Street
 PHILADELPHIA, Widener Building
 PITTSBURGH, Frick Building
 BUFFALO, 337 Washington Street
 DETROIT, Foot of First Street
 CINCINNATI, Union Trust Building

SALT LAKE CITY, Walker Bank Building

CLEVELAND, Western Reserve Building
 BALTIMORE, 32 South Charles Street
 WILKES-BARRE, PA., Miners Bank Building
 ST. LOUIS, MO., Liberty Central Trust Co. Building
 ST. PAUL-MINNEAPOLIS, Pioneer Building, St. Paul
 KANSAS CITY, MO., 417 Grand Avenue
 OKLAHOMA CITY, First National Bank Building
 BIRMINGHAM, ALA., Brown-Marx Building
 DENVER, First National Bank Building

EXPORT REPRESENTATIVES, UNITED STATES STEEL PRODUCTS Co., 30 Church Street, New York

PACIFIC COAST REPRESENTATIVES, UNITED STATES STEEL PRODUCTS Co., San Francisco, Los Angeles, Portland, Seattle

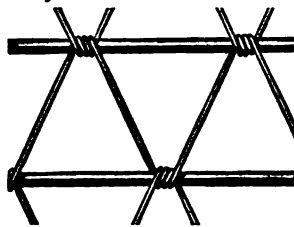
Products

Manufacturers of TRIANGLE MESH and ELECTRICALLY WELDED WIRE FABRICS for Concrete Reinforcement.

For Wire Rope, see page 52; for Electric Wires and Cables, see page 768.

Uses

Triangle Mesh and Electrically Welded Fabrics are used for all types of reinforced concrete work including floors, walls, pipe, pavements and reservoirs.



TRIANGLE MESH CONCRETE REINFORCEMENT
Solid Longitudinals

Triangle Mesh Reinforcement

A woven wire reinforcement having diagonal cross or secondary members.

TRIANGLE MESH REINFORCEMENT

Style No.	No. and gage of wires ea., longitudinal, A. S. & W. Co.'s steel wire gage	Sec. area longitudinal, sq. in. per ft. width	Totaleffective longitudinal sec. area, sq. in. per ft. w't'h	Approximate wt., lbs. per 100 sq. ft.
Longitudinals Spaced 4 in. Cross Wires No. 14-gage, Spaced 4 in.				
032	1—No. 12 gage	.026	.032	22
040	1—No. 11 gage	.034	.040	25
049	1—No. 10 gage	.043	.049	28
058	1—No. 9 gage	.052	.058	32
068	1—No. 8 gage	.062	.068	35
080	1—No. 7 gage	.074	.080	40
093	1—No. 6 gage	.087	.093	45
107	1—No. 5 gage	.101	.107	50
126	1—No. 4 gage	.120	.126	57
146	1—No. 3 gage	.140	.146	65
153	1— $\frac{1}{2}$ in.	.147	.153	68
168	1—No. 2 gage	.162	.168	74
180	2—No. 6 gage	.174	.180	78
208	2—No. 5 gage	.202	.208	89
245	2—No. 4 gage	.239	.245	103
267	3—No. 6 gage	.261	.267	111
287	3—No. 5 gage	.281	.287	119
309	3—No. 4 gage	.303	.309	128
336	3—No. 3 gage	.330	.336	138
365	3—No. 2 gage	.359	.365	149
395	3—No. 1 gage	.389	.395	160

Longitudinals Spaced 4 in. Cross Wires No. 14-gage, Spaced 8 in.				
036P	1—No. 12 gage		.036	17
044P	1—No. 11 gage		.044	20
053P	1—No. 10 gage		.053	24
062P	1—No. 9 gage		.062	27
072P	1—No. 8 gage		.072	31
084P	1—No. 7 gage		.084	35
097P	1—No. 6 gage		.097	40

Longitudinals Spaced 4 in. Cross Wires No. 12½-gage, Spaced 8 in.				
041R	1—No. 12 gage		.041	21
049R	1—No. 11 gage		.049	24
058R	1—No. 10 gage		.058	28
067R	1—No. 9 gage		.067	31
077R	1—No. 8 gage		.077	35
089R	1—No. 7 gage		.089	40
102R	1—No. 6 gage		.102	44

Length of rolls: 150 ft., 200 ft. and 300 ft.

Widths: approximately 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, and 56 in.

NOTE—Material may be furnished either plain or galvanized.

Electrically Welded Fabric

A rectangular mesh, having the secondary wires electrically welded to the main or longitudinal wires at their intersections.

ELECTRICALLY WELDED FABRIC

Spacing of wires in.		A. S. & W. Co.'s steel wire gage No.		Sectional area per lin. ft., sq. in.		Weight, lbs. per 100 sq. ft.
Longit.	Trans.	Longit.	Trans.	Longit.	Trans.	
2	16	0	5	.443	.025	164.2
2	16	1	7	.377	.018	138.9
2	16	2	8	.325	.015	119.4
2	16	3	8	.280	.015	103.6
2	16	4	9	.239	.013	88.5
2	16	5	10	.202	.011	74.6
3	16	0	5	.295	.025	114.1
3	16	1	7	.252	.018	96.2
3	16	2	8	.216	.015	82.6
3	16	3	8	.187	.015	72.0
3	16	4	9	.159	.013	61.4
3	16	5	10	.135	.011	51.8
3	16	6	10	.116	.011	45.1
3	16	7	11	.098	.009	38.1
4	16	0	5	.221	.025	89.1
4	16	1	7	.189	.018	74.8
4	16	2	8	.162	.015	64.3
4	16	3	8	.140	.015	56.1
4	16	4	9	.120	.013	47.9
4	16	5	10	.101	.011	40.4
4	16	6	10	.087	.011	35.2
4	16	7	11	.074	.009	29.7
4	16	8	12	.062	.007	24.7
4	16	9	12	.052	.007	21.1
4	16	10	12	.043	.007	17.9
4	16	11	12	.034	.007	14.8
4	16	12	12	.026	.007	11.8
4	12	1	6	.189	.029	78.5
4	12	2	8	.162	.021	66.1
4	12	3	7	.140	.025	59.3
4	12	3	8	.140	.021	57.9
4	12	4	8	.120	.021	50.6
4	12	4	9	.120	.017	49.4
4	12	5	10	.101	.014	41.6
4	12	6	10	.087	.014	36.5
4	12	7	10	.074	.014	31.8
4	12	7	11	.074	.011	30.7
4	12	8	10	.062	.014	27.4
4	12	8	11	.062	.011	26.4
4	12	9	12	.052	.009	21.8
4	12	10	12	.043	.009	18.6
4	12	11	12	.034	.009	15.5
4	12	12	12	.026	.009	12.6
4	8	12	12	.026	.013	14.1
6	8	12	12	.017	.013	11.1
2	2	12	12	.052	.052	36.8
4	4	6	6	.087	.087	61.9
4	4	7	7	.074	.074	52.6
4	4	8	8	.062	.062	44.1
6	6	6	6	.058	.058	42.0
6	6	7	7	.049	.049	35.7
6	6	8	8	.041	.041	29.9
6	6	9	9	.035	.035	25.0
6	6	10	10	.029	.029	20.7

Other combinations can be promptly furnished.

Widths:—Any multiple of the spacing of longitudinal wires up to a maximum of 96 in. for 6-in. or 4-in. spacing, 84 in. for 3-in. spacing and 60 in. for 2-in. spacing. (56-in. for No. 0 gage spaced 2 in.)

The transverse wires extend 1 in. beyond the outside longitudinal wires. Square footage or square yardage will be figured exclusive of these projections. Extra charge made for widths narrower than 48 in.

Lengths:—Styles having longitudinal No. 3 gage or smaller, made regularly in standard rolls of 150 ft., 200 ft. and 300 ft. Styles having longitudinal larger than No. 3 gage made regularly in strengthened and cut sheets only.

Weights:—All above weights are based on a width of 60 in. measured from center to center of the outside or selvage longitudinal wires.

CORRUGATED BAR COMPANY, INC.

Concrete Reinforcement

Mutual Life Building
BUFFALO, N. Y.

DISTRICT OFFICES

NEW YORK, N. Y., Whitehall Building, 17 Battery Place
CHICAGO, ILL., 20 West Jackson Boulevard
PHILADELPHIA, PA., Transportation Building
BOSTON, MASS., 27 School Street, Boston, 9
DETROIT, MICH., 400 Penobscot Building

ST. LOUIS, MO., Boatmen's Bank Building
ST. PAUL, MINN., Pioneer Building
SYRACUSE, N. Y., Union Building
MILWAUKEE, WIS., 1120 Wells Building
ATLANTA, GA., 404 Candler Building

Products

CORRUGATED BARS; CORR-BAR UNITS; COLUMN SPIRALS; CORR-PLATE FLOORS; CORR-MESH, a ribbed Expanded Metal.

Corrugated Bars

All bond is mechanical—it is the entering of cement into irregularities in surface of reinforcing material. In smooth bars, such adhesion as takes place is entering of cement into the microscopic surface pores of the metal. This is very small, particularly in small bars, which are somewhat cold rolled, and in which surface pores are of negligible value for this purpose. Furthermore, when a working stress of 16,000 lbs. per sq. in. is developed in steel, the diameter has been materially reduced; i.e., material when compared to depth of surface pores.



CORRUGATED ROUNDS (PATENTED)

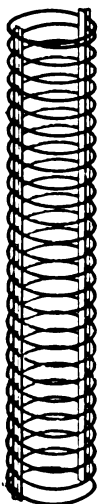
Corrugated Bars are rolled both round and square in cross section and have ridges or corrugations which effect a positive mechanical bond with concrete. Made of intermediate grade steel.

Bond Tests—Many bond tests on beams under stress made at different places have invariably shown the Corrugated Bar to be superior in a marked degree to all other types of reinforcement.

Sizes—We carry in stock, Corrugated Bars of the standard sizes having areas equivalent to $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$ and 1 in. round; and $\frac{1}{2}$, 1, $1\frac{1}{8}$ and $1\frac{1}{4}$ in. square.

Column Spirals

Spirals for columns are shop fabricated, made of cold drawn wire with T-section spacers and furnished in any length, in diameters of 10 to 36 in., pitch 1 to 4 in. A large stock is at all times available for immediate shipment.



SPIRALS FOR COLUMNS

Corr-Bar Units

Insure correct reinforcement in accordance with specifications and save much labor cost because only one piece has to be handled instead of fifteen to twenty. Shop fabricated and self-positioning reinforcement for concrete beams and girders. Each unit, representing the entire reinforcement for beam, anchored rigidly together, is made collapsible for shipment, and is opened on the job and set in the form where it positions itself.



CORR-BAR UNITS (PATENTED) READY TO PLACE

Corr-Plate Floors

A 2-way system of reinforcing that has been determined by the Research Department of this company to be scientifically correct and far more economical than any "umbrella" form of reinforcing for a flat slab concrete floor.

This Department's extensive laboratory and field tests have proved that in over 90% of the area of the panel, the lines of principal stress are parallel to sides of panel. Corr-Plate floors satisfy these requirements.

In Corr-Plate floors, a cap about 2 in. thick is used around column to take care of stresses which are much greater there, at the same time saving much concrete. Cap can be underneath the floor or if wood flooring is used, on top, leaving a perfectly smooth ceiling.

Corr-Plate floors save in total height of structure for given clear story heights. Forms and ease of erection are simpler; lighting and ventilation are better. Large savings are effected in cost of sprinkler, shafting, piping, elevators and other installations.

Corr-Mesh

Corr-Mesh is an expanded metal with integral stiffening ribs connected by a diamond mesh. It is so expanded that no internal stresses are produced in the metal; it is not necessary to handle it carefully in order to avoid splitting, a condition peculiar to the over-expanded products. A protective coating of paint is applied after expansion.

Ribs obviate necessity of studs for partitions, practically eliminate centering for floor and roof construction, and materially reduce amount of light steel framing required for suspended ceilings.

Kinds—There are 2 kinds of Corr-Mesh; one with $\frac{3}{4}$ -in. ribs and the other with $\frac{1}{8}$ -in. ribs. The former is called " $\frac{3}{4}$ -in. Rib Corr-Mesh," the latter " $\frac{1}{8}$ -in. Rib Corr-Mesh."

Gages—Standard sheets of both kinds are made in Nos. 24, 26 and 28 U. S. gages, painted. Other gages can be furnished if required.



$\frac{3}{4}$ -IN. RIB CORR-MESH

General

Catalogues, detailed information, etc., sent in response to requests on business letterheads.

CONCRETE STEEL COMPANY

42 Broadway
NEW YORK, N. Y.

SALES OFFICES

CHICAGO	HARTFORD	ST. LOUIS	KANSAS CITY	BOSTON	NORFOLK
DETROIT	BIRMINGHAM	PHILADELPHIA	CINCINNATI	OMAHA	CLEVELAND
PITTSBURGH	WASHINGTON	SYRACUSE	ST. PAUL		DES MOINES

WAREHOUSES AND FABRICATING WORKS

YOUNGSTOWN	NORFOLK	PHILADELPHIA	SYRACUSE	NEW YORK	BOSTON	CINCINNATI
CHICAGO	BIRMINGHAM	ST. PAUL	ST. LOUIS	KANSAS CITY	CLEVELAND	DETROIT

Products

CONCRETE REINFORCEMENT BARS; COLLAPSIBLE COLUMN REINFORCEMENT; CONCRETE REINFORCEMENT DEVICES, including SUPPORTING, SPACING and TYING DEVICES, such as Bar-Spacers, Bar-Tys, Ty-Chairs, Hy-Chairs, Easel Chairs and Beam Saddles, for holding bars in place in forms; WIRE SOFFIT CLIPS; WALL ANCHORS and TIES; CONCRETE INSERTS; CURB BARS; EXPANDED METAL LATH (Plain and Self-furring); EXPANDED METAL; COLD FORMED CHANNELS; CORNER BEADS; SAFETY STAIR TREADS.

Engineering Departments

Experienced and efficient engineering departments are maintained in our district sales offices.

Large Stocks Carried at Widely Distributed Points

Quick shipments are made possible by the large stocks of Havemeyer products carried at advantageously located distributing points throughout the United States. Contractors may secure them immediately—an important item in rush work and on large jobs.

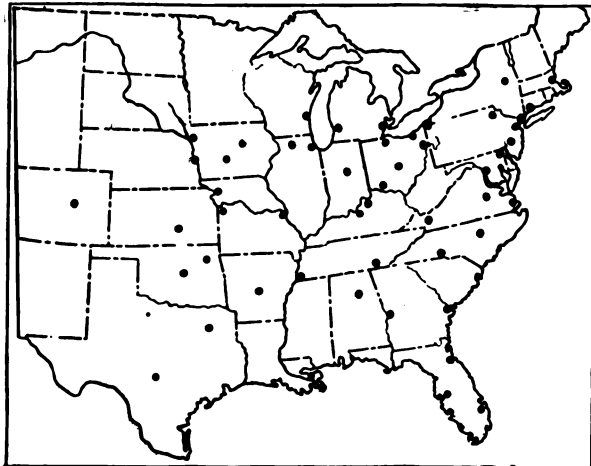


FIG. 1. DISTRIBUTING CENTERS OF CONCRETE STEEL COMPANY
Every dot a stock of Havemeyer Bars

Havemeyer Concrete Reinforcement Bars

These deformed bars (Figs. 2 and 3) are rolled in square and round sections, with deformations running longitudinally and entering directly into tensile strength of bar. At all points they have constant uniform area of cross section exactly equal to cross-sectional area of plain bar of same size. Combines the advantages of a deformed bar with weight of a plain bar. As projections and depressions are rolled longitudinally, there are no sharp angles to start a fracture when bar is bent. Tests prove the superior bending qualities of Havemeyer bars.

Specifications for Steel—Havemeyer bars are rolled to any desired standard specification from new billet steel at mills which do not re-roll rails.

Shop Bending and Fabricating—Our warehouses are equipped for accurately bending and fabricating bars. This service eliminates a bending gang and bending machines on the job. Our warehouse charges for bending are less than it would cost the contractor if he did the work himself. Shop bending assures the engineer that every bar is bent accurately.



FIG. 2. Round



FIG. 3. Square

HAVEMEYER CONCRETE REINFORCEMENT BARS

TEN STANDARDIZED SIZES CARRIED IN STOCK

Size, in.	1 1/4	1 1/2	1	1	3/4	3/4	3/4	3/4	3/4
	sq.	sq.	sq.	rd.	rd.	rd.	rd.	sq.	rd.
Area, sq. in.	1.563	1.266	1.000	.785	.601	.442	.307	.250	.196
Weight per ft., lbs.	5.313	4.303	3.400	2.670	2.044	1.502	1.043	.850	.668
Mill extra for size per 100 lbs.	Base	Base	Base	Base	Base	Base	5c	10c	25c

Havemeyer deformed bars have a uniform area of cross section and the same weight per foot as plain bars.

Above standardized sizes recommended by the War Industry Board and adopted by the American Concrete Institute and by the Distributors of Reinforcing Bars.

Collapsible Column Reinforcement

We furnish Havemeyer collapsible spirals, ready to be opened up and placed in forms. We also furnish Havemeyer collapsible columns fabricated in our warehouses, or we furnish materials so that they can be fabricated by the contractor on the job.

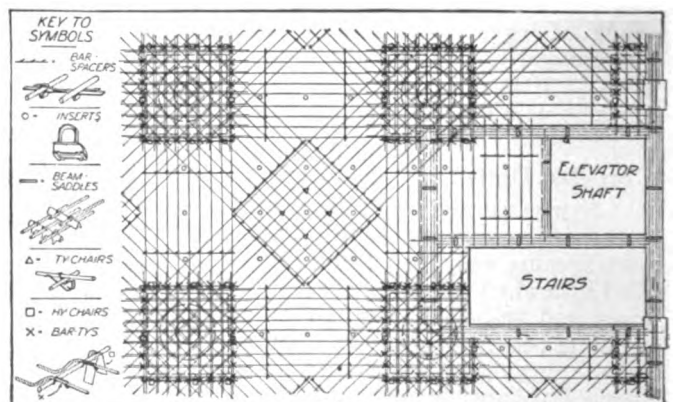


FIG. 4. APPLICATION OF HAVEMEYER SUPPORTING, SPACING AND TYING DEVICES IN TYPICAL FOUR-WAY FLAT SLAB

Usually two Havemeyer Bar-Spacers are used for each band. Havemeyer Hy-Chairs at column heads support head rods or raising rods. Bent slab bars are held rigidly to raising rods with Bar-Tys. Ty-Chairs support center of diagonal band if spans become very great. Beam-Saddles spaced at about 5-in. centers. Beam-Separators which hold up second layer of steel spaced at about 5-in. centers. On two-way slab, the same general principle is used.

Havemeyer Devices for Supporting, Spacing and Tying Bars in Forms

These devices offer many decided advantages. The designer knows that every bar is exactly in its intended position. The bars are held rigidly and at the correct distance apart; they are also kept at proper distance above the forms. Where bars intersect, they can, if necessary, be held rigidly together with Bar-Tys or with Ty-Chairs. Booklets Nos. A4 and A8. (Figs. 5 to 11, inclusive.)

Security Anchor and Wall-Tys

For bonding brick veneer, stone, terra cotta and tile wainscoting to walls, etc.; for suspending metal lath ceilings and for holding floor sleepers, screeds, nailing strips, etc. (Figs. 15 and 16.)

Concrete Inserts

Dayton Adjustable-Inserts—Malleable iron, cast in one piece with keyhole slot for adjustment. Booklet No. A7. (Fig. 14.)

Havemeyer "Y" Socket-Inserts—Highest grade malleable iron. Broad nailing base with four nailing holes insures against displacement. Booklet No. A7.

Havemeyer Slotted-Inserts—Pressed steel.

Placed end to end. Prevent seepage of concrete to inside. Booklet No. A7. (Fig. 12.)

Havemeyer Curb Bars

We make round nose and angle nose curb bars for stair nosings and platform edges. Booklet No. A6. (Fig. 13.)

Havemeyer Expanded Metal Lath

Made in all sizes and gauges. Booklet No. A3.

Havemeyer Expanded Metal

For concrete reinforcement, especially for culverts, sewers, machinery guards, etc. Booklet No. A3.

Havemeyer Cold Formed Channels

Made in all sizes and gauges. Booklet No. A3.

Havemeyer Corner Beads

Wing Corner Bead—The stiffest bead on the market. Booklet No. A3.

Rail Corner Bead—*Easily bent*. Especially suitable for arches and similar work. Booklet No. A3.

Havemeyer Safety Stair Treads ("SaniTread")

For use on concrete steps. Booklet No. A6.



FIG. 5. SECURO BAR-SPACERS
For supporting, spacing and holding slab reinforcing bars. Booklet No. A8



FIG. 7. HAVEMEYER HY-CHAIR
For supporting head rods over columns and bent-up bars in slabs. Booklet No. A8



FIG. 9. HAVEMEYER BEAM-SADDLE AND SEPARATOR
For supporting, spacing and holding reinforcing bars in beams, girders, lintels, etc. Locking device holds bars in position. Booklet No. A8

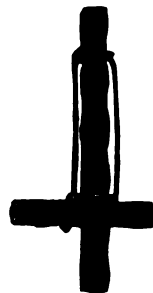


FIG. 6. HAVEMEYER BAR-TY
For tying together reinforcing bars at intersections. Booklet No. A4

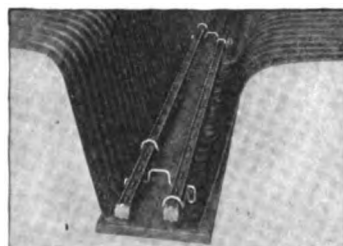


FIG. 8. HAVEMEYER EASEL-CHAIR
For supporting and spacing two bars in a joist. Booklet No. A4



FIG. 10. X-TENSION CLIPS (SOFFIT CLIPS)
For fireproofing steel beams, girders, columns, etc. Booklet No. A4



FIG. 11. HAVEMEYER TY-CHAIR
For tying and supporting slab reinforcing bars. One Ty-Chair used at each intersection on large bars and at every third intersection on small bars. Booklet No. A4



FIG. 12. HAVEMEYER SLOTTED-INSERT
Booklet No. A7



FIG. 13. HAVEMEYER ROUND NOSE CURB BAR
Booklet No. A6



FIG. 14. DAYTON NO. 3 ADJUSTABLE-INSERT
Booklet No. A7



FIG. 15. PLACING A SECURITY WALL-TY
No. 1 Wall-Ty, 3 3/4 in. long, for single course; No. 2, 6 3/4 in., for two courses or for corners. Booklet No. A5

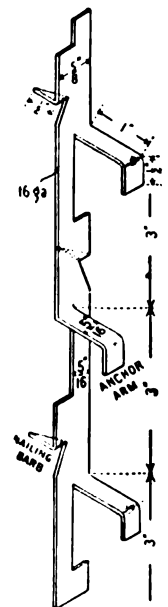


FIG. 16. DETAIL OF SECURITY ANCHOR
Booklet No. A5

THE GENERAL FIREPROOFING COMPANY

Expanded Metal Lath, Expanded Metal Reinforcement, Steel Tile for
Floor Construction, and Steel Lumber

YOUNGSTOWN, OHIO

BRANCH OFFICES

CHICAGO, 325 W. Madison Street
NEW YORK, 257-63 E. 133rd Street
BOSTON, 125 Federal Street
BUFFALO, Ellicott Square Building
BALTIMORE, 15 E. Fayette Street

ATLANTA, 257-63 Decatur Street
PHILADELPHIA, 614 Bulletin Building
CLEVELAND, Builders' Exchange
KANSAS CITY, 1009 Waldheim Building
OMAHA, 213 Kennedy Building
SYRACUSE, 707 Keith Theater Building

MINNEAPOLIS, 754 Builders' Exchange
MILWAUKEE, 1018 First Wisconsin National
Bank Building
SAN FRANCISCO, 20 Beale Street
LOS ANGELES, 618 Washington Building

EXPORT DEPARTMENT: 438 Broadway, NEW YORK

Products

"HERRINGBONE" RIGID METAL LATH,
Painted, Galvanized or Armco Ingot Iron.
"KEY" EXPANDED METAL LATH.

COLD ROLLED CHANNELS, used as Stud-
ding for Metal Lath Partitions and as Fur-
ring for Suspended Ceilings, Cornices, False
Beams and Ornamental Plaster Work.

CORNER BEAD, for supporting and protecting ex-
posed plaster corners.

"SELF-SENTERING," an Expanded Metal Reinforce-
ment for Concrete, acting as both Form and Rein-
forcement or as Lath and Stud.

DIAMOND RIB LATH, a rib reinforced lath used for
Plastering, Suspended Ceilings, etc.

EXPANDED METAL ANGLES.

"TRUSSIT," a patented Reinforcement for Curtain
Walls and Partitions without studding.

EXPANDED METAL, the general purpose Reinforce-
ment for Concrete Work.

STEEL LUMBER, used similarly to wood joists and
studs in Fire Resistive Floor and Partition Construction.

"PEDS," patented Spot Grounds for attaching wood
and metal trim to walls, and screeds to concrete floors.

STEEL-TILE and END-TILE—Steel Forms for joisted
Concrete Floor Slabs.

For Waterproofings, Dampproofings and Technical
Paints, see pages 66-67.

Handbooks

GF publications cover construction data concern-
ing our products completely and include standard
specifications.

The "Herringbone" Catalogue contains full infor-
mation on "Herringbone" metal lath with construction
details and specifications.

The "Fireproofing" Handbook treats fully the uses
of "Self-Sentering," "Trussit" and expanded metal.

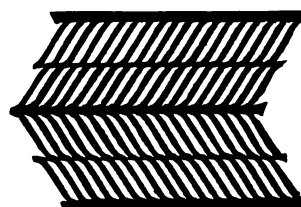
The "Steel-Tile" Handbook includes drawings, for-
mulas, tables and computations for the concrete designer.

The "Steel Lumber" Handbook gives data on fire
resistive floor and partition construction using GF Steel
Lumber.

Specific information on any of these products,
together with advice and estimates on particular appli-
cations, can be obtained from
our Engineering Service De-
partment.

"Herringbone" Expanded Metal Lath

"Herringbone" metal
lath, universally used because
of its stiffness, is, on account
of its heavy, longitudinal
ribs, the most rigid metal



"HERRINGBONE" EXPANDED
METAL LATH,
STYLE BB



TRADE-MARK
Reg. U. S. Pat. Office

lath made. Its use permits the widest stud
or joist spacing.

"Herringbone" offers a firm surface,
over which it is easy to lay a level coating
of plaster. It will not buckle or sag be-
tween supports, which means a saving of
plaster and labor. The interlocking edges

eliminate waste from lapping and materially reduce the
cost of lacing the sheets together.

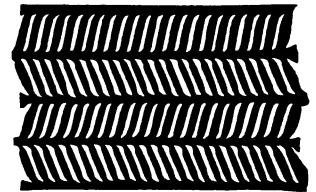
The mortar curls around the flattened cross strands
and the main ribs, forming a
perfect key and embedding
the metal lath therein.

"Herringbone" metal
lath is carefully painted to
protect it until the plaster is
applied. It is always fur-
nished painted, unless or-
dered galvanized. Suitable
for all interior plastering and
exterior stucco work.

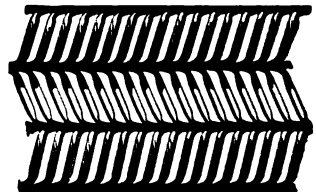
Where unusually severe conditions prevail, "Her-
ringbone" can be furnished galvanized or made from
"Armco" ingot iron.

The "Herringbone" Cat-
alogue, containing standard
lathing, plastering and ce-
ment stucco specifications,
mailed on request.

For complete specifica-
tions for the use of "Her-
ringbone" metal lath, send
for the "Herringbone" Hand-
book.



"HERRINGBONE" EXPANDED
METAL LATH,
STYLE A



"HERRINGBONE" EXPANDED
METAL LATH,
STYLE AAA

HERRINGBONE EXPANDED METAL LATH. APPROXIMATE WEIGHT PER SQUARE YARD

Gage No., U. S. Standard | Weight, painted, lbs. | Weight, galvanized, lbs.

STYLE BB, STANDARD LATH FOR CEMENT SIDING CONSTRUCTION AND FIRE-
PROOF PARTITION

27	2.25	2.82
26	2.50	Not made
24	3.37	3.91
22	4.21	Not made

Sheets 20 1/4 x 96 in., 1 1/2 sq. yds. Size of mesh, 3/4 x 1 1/4 in.
Packed 15 sheets (22 1/2 sq. yds.) to the bundle.

STYLE A, STANDARD LATH

28	3.00	3.75
----	------	------

Sheets 13 1/2 x 96 in., 1 sq. yd. Size of mesh, 3/4 x 1 in.
Packed 20 sheets (20 sq. yds.) to the bundle.

STYLE AAA, THE "GENERAL PURPOSE" LATH

27	2.53	3.17
26	2.81	Not made
24	3.79	4.39
*22	4.74	Not made

Sheets 18 x 96 in., 1 1/2 sq. yds. Size of mesh, 3/4 x 1 1/4 in.
Packed 15 sheets (20 sq. yds.) to the bundle.

*Furnished from mill shipment only.

NOTE—All styles furnished painted, galvanized or made from rust re-
sisting "Armco" iron.

GF Cold Rolled Channel Studding and Furring

Rolled from No. 16 gage steel, with square corners and true right angle sides. GF channels are light, stiff and straight; therefore, easily erected.

GF cold rolled channels are used for studding in solid or hollow partitions, for furring on flat or suspended ceilings, false beams and columns, cornice work, and on masonry.

Plain channels furnished in widths of $\frac{3}{4}$, 1, $1\frac{1}{2}$ and 2 in., and lengths of 12, 14, 16, 18 and 20 ft.

Perforated channels (punched for wiring metal lath) furnished in widths $1\frac{1}{2}$ and 2 in., same lengths as plain channels.

Both styles stocked in large quantities.

GF Corner Bead

A heavy galvanized bead, rigid enough to make erection easy and so designed that the plaster coat is carried tight up to the nose and held firmly in place. GF corner bead insures a straight, solid corner.

Made with or without clip. No. 26 gage. Stock lengths of 6, 7, 8, 9 and 10 ft.

"Key" Expanded Metal Lath

"Key" Expanded Metal Lath is extensively used in all locations and is especially suitable for curved surfaces because of its uniform pliability.

"Key" lath is easy to handle and erect. The small mesh insures its complete envelopment in plaster, with the use of a minimum amount of material. The large sheets reduce the number of laps and save both labor and material.



"KEY" EXPANDED METAL LATH

APPROXIMATE WEIGHT PER SQUARE YARD

Gage No., U.S. Standard	Weight, painted, lbs.	Weight, galv., lbs.
27	2.30	2.73
26	2.50	2.94
25	3.05	3.32
24	3.40	3.74
*22	4.00	Not made

Sheets 24x96 in., packed 15 sheets to a bundle, 26 $\frac{1}{2}$ sq. yds.
Can also be furnished of rust resisting "Armco" iron.
*Furnished from mill shipment only.

"Self-Sentering"

"Self-Sentering" is a combined reinforcement and centering used extensively for concrete floor and roof construction. It is also used for solid and hollow walls, light partitions, etc., making possible a light weight, thin slab, built without expensive formwork, and equal to cast reinforced concrete in fire protection.

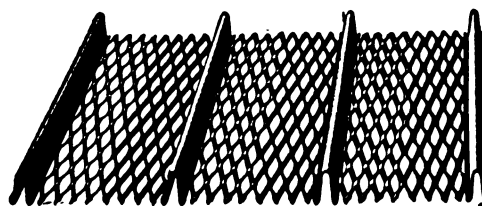
Roofs of any design and pitch can be built with "Self-Sentering" without solid forms.

"Self-Sentering" is an expanded metal sheet, stiffened by heavy ribs $\frac{1}{4}$ in. high, and spaced $3\frac{5}{8}$ in. apart. The ribs carry the weight of the concrete until set; the diamond mesh forms a perfect bond for the concrete.

Sheets are 29 in. wide and are furnished in lengths from 4 to 12 ft., in variation of 1 ft. Long sheets permit rapid erection and minimum laps. The side ribs nest snugly.

"Self-Sentering" Floor Designs

"Self-Sentering" Floor, Type No. 1—"Self-Sentering" is attached direct to steel beams by clips; concrete is applied to the desired thickness and the underside plastered with cement mortar. Sides of beam boxes are wired together, to save bracing across the span. To



"SELF-SENTERING"

Patented March 3, 1914

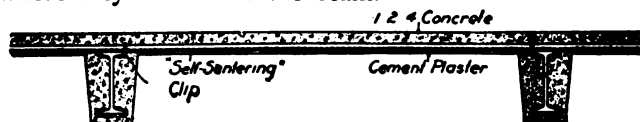
STOCK GAGES AND WEIGHTS PER SQUARE FOOT

Gage No., U.S. Standard	Weight, painted, lbs.	Weight, galvanized, lbs.	Section area per foot width, sq. in.
28	.58	.73	.173
26	.70	.83	.208
24	.93	Not made	.277

Other gages furnished on special order.

Galvanized "Self-Sentering" furnished on special orders only.

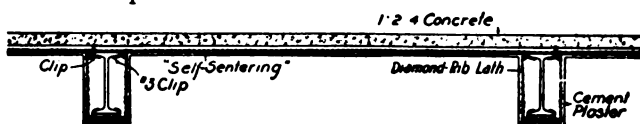
permit pouring the beam covering at the same time, punch out the mesh between the "Self-Sentering" ribs where they come over the beam.



"SELF-SENTERING" FLOOR, TYPE NO. 1

"Self-Sentering" Floor, Type No. 2—This type is the same as No. 1, except that beams are fireproofed with metal lath and plastered.

This can be done at the same time the underside of the slab is plastered.



"SELF-SENTERING" FLOOR, TYPE NO. 2

SAFE UNIFORMLY DISTRIBUTED LIVE LOADS, LBS. PER SQUARE FOOT ON "SELF-SENTERING" SLABS

Assumptions:

Stress in steel, 16,000 lbs. per sq. in.

Ratio between the moduli of elasticity, 15.

Center of gravity, .19 in. above bottom of slab.

R. M. = resisting moments per foot width in inch-pounds; f c = maximum extreme fiber stress in concrete.

$$\text{Bending moment} = \frac{W.L.}{10}$$

Gage "Self- Senter- ing"	Thickness of slab above mesh, in.	R. M.	f c	Safe uniformly distributed live loads per sq. ft. for spans indicated					
				3 ft.	4 ft.	5 ft.	6 ft.	7 ft.	8 ft.
28	2	4,360	660	310	164	98	61	...	...
26	2	5,190	760	359	192	128	92	49	...
24	2	6,210	800	476	258	166	110	64	30
28	2 $\frac{1}{2}$	5,625	560	419	233	150	93	57	...
26	2 $\frac{1}{2}$	6,710	650	484	279	186	118	76	50
24	2 $\frac{1}{2}$	8,720	680	...	377	254	165	111	76
28	3	6,920	500	561	311	184	114	73	45
26	3	8,240	560	...	386	231	147	97	64
24	3	10,820	660	...	512	322	210	143	100
28	3 $\frac{1}{2}$	8,250	460	...	368	218	135	80	50
26	3 $\frac{1}{2}$	9,800	500	...	455	274	174	115	76
24	3 $\frac{1}{2}$	12,750	610	...	...	375	245	166	116
28	4	9,500	425	...	439	261	164	105	68
26	4	11,300	460	...	533	320	206	136	91
24	4	14,800	560	...	...	436	286	196	137

Tables for other spans, also tables and complete data for all types of "Self-Sentering" floors and roofs, are given in the "Fireproofing Handbook." A copy of the latest edition available on request.

Diamond Rib Lath

A rib reinforced lath stiffened by U-shaped ribs approximately $\frac{3}{8}$ in. high, 4.8 in. on centers, with diamond mesh between the ribs.

Diamond Rib Lath is primarily a plaster base for walls or suspended ceilings, permitting, through its exceptional rigidity, a wider spacing of supports.

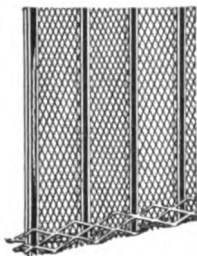
Manufactured in Nos. 24, 26 and 28 gage. All sheets 24 in. wide, and 8 ft. long. (Special lengths involving 5 tons or more furnished on mill order.)

Weights of Diamond Rib Lath are as follows:

No. 28 gage.....	3.0 lbs. per sq. yd.
No. 26 gage.....	3.6 lbs. per sq. yd.
No. 24 gage.....	4.8 lbs. per sq. yd.

Expanded Metal Angles

For attaching "Trussit" or "Self-Sentering" to floor and ceiling in studless partition and curtain wall construction. Made of No. 11 gage steel; furnished in lengths up to 8 ft.



EXPANDED METAL ANGLES

"Trussit"

"Trussit" is an expanded steel reinforcement specially designed for solid plastered fireproof walls and partitions; also, for hollow walls, curtain walls, elevator enclosures, small individual structures, or office partitions in large buildings where fireproof, soundproof partitions are required.

"Trussit" eliminates the usual studding, a few temporary braces being required only till the first plaster coat has set. Sheets are attached to floor and ceiling with expanded metal angles or by other methods that insure a firm support.

"Trussit" is uniformly expanded in both directions. This makes it possible to plaster both sides exactly alike and, when the wall is finished, steel and concrete are so uniformly distributed that cracking from expansion or contraction is prevented.

Stocked in gages Nos. 27, 26 and 24 and sheets 8, 10 and 12 ft. long; sheets uniformly 19 in. wide. Furnished painted, galvanized or "Armco" ingot iron.



"TRUSSIT"
(Patented)

Expanded Metal Reinforcement

Expanded metal, made by expanding sheets of steel into a diamond shape mesh, has greater reinforcing strength, pound for pound, than any other material. It is cut and expanded to the sizes required for particular classes or sizes of work.

DATA. EXPANDED METAL

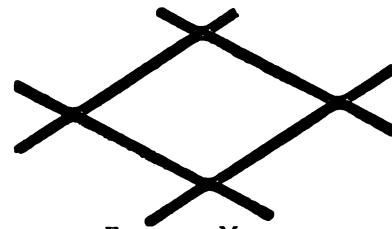
Style	Size mesh, short way of diamond, in.	Nominal gage of metal	Net section area per foot width, sq. in.	Approx. weight per sq. ft., lbs.	Standard size sheets	
					Lengths long way of diamond	Widths short way of diamond
1½-12-194	1½	12	.194	.66	6', 8'	3', 4', 6'
½-18-220	½	18	.220	.75	6', 8'	4', 5', 6'
3-10-353	3	10	.353	1.20	6', 8', 9' and 10'8"	3', 4', 6'
3-10-265	3	10	.265	.90	6', 8', 9' and 10'8"	4', 5'4"
3-10-176	3	10	.176	.60	6', 8', 9' and 10'8"	3', 4', 5', 6'
3-12-150	3	12	.150	.51	6', 8', 9' and 10'8"	4', 5'
3-16-082	3	16	.082	.278	6', 8' and 10'8"	3', 4', 5', 6'
¾-12-246	¾	12	.246	.84	6', 8'	4', 4', 6', 6'

A full line of expanded metal carried in stock at all times.

The larger meshes are used for reinforcing concrete in the construction of floors, roofs, sidewalks over basements, bridge decks, retaining walls, sewers,

conduits, tanks, reservoirs, etc.

Smaller meshes are used in lighter cement work and for railings, window guards, elevator and tool room enclosures.



EXPANDED METAL

"Peds"

"Peds" are patented spot grounds for attaching wood or metal trim to walls, and screeds to concrete floors. They avoid the dangerous practice of embedding wood strips in masonry.

Wall "Peds" adhere permanently to metal lath, brick, concrete, gypsum block or hollow tile surfaces. They are set with ordinary gypsum wall plaster, which keys through the holes in the metal rim, and are firmly held in place by the finished plaster. "Peds" are easily and economically applied and give a better nailing base for wall trim at a much lower grounding cost.

Floor "Peds" are set in cement mortar beds in rows 16 in. on centers and 18 to 24 in. apart. Screeds are then nailed to the "Peds," providing a firm base for the floor.

"Peds" will not shrink, come loose, or split when nails are driven in.

Steel-Tile and End-Tile

GF Steel-Tile are light weight steel forms for joisted concrete floor slabs, designed on the well-known T-beam principle—deep reinforced joists and thin connecting slabs of concrete.



GF STEEL-TILE

Steel-Tile secures the substantial reduction in dead weight. Useless concrete is eliminated, reducing the dead load on girders, columns, foundations and footings, and permitting a lighter construction throughout, without sacrificing strength.

PROPERTIES OF STEEL-TILE FLOORS

Width of joists, in.	Center to center of joists, in.	2 in. of Concrete Above					
		Size Steel-Tile. . . .	6 in.	8 in.	10 in.	12 in.	14 in.
4	24	Average weight per sq. ft., lbs. . .	40.1	46.0	53.5	61.0	72.6
		Cu. ft. of concrete per sq. ft. of floor	.278	.319	.371	.423	.505
		Core area, per cent of section.	58.3	61.7	63.0	63.8	62.2
		Average weight per sq. ft., lbs. . .	42.3	49.4	57.1	65.3	78.4
5	25	Cu. ft. of concrete per sq. ft. of floor	.293	.342	.396	.452	.537
		Core area, per cent of section.	55.9	59.2	60.3	61.2	59.7

Send for GF Steel-Tile Handbook.

GF Steel-Tile make the old, expensive solid form work unnecessary. Centering along the line of joists, which are 25 in. apart, is sufficient. Flanges are flat and fit snugly against forms, preventing any leakage of concrete.

Steel-Tile are adapted to schools, hotels, office buildings, department stores, apartments, warehouses, lofts, etc. Wherever long spans are required GF Steel-Tile construction will be found most economical.

Flat ceilings are easily constructed under Steel-Tile

floors. Suspended ceilings are supported from hangers which are placed in joists before pouring concrete.

GF Steel-Tile with End-Tile to match are made of corrugated steel in sizes of 4, 6, 8, 10, 12 and 14 in., also 10, 12 and 14 in. in tapered tile and tapered ends. Steel-Tile are furnished in lengths of 30 and 35 in. Width at bottom, 20 in., exclusive of flange. Shipped nested.



GF END-TILE

GF Steel Lumber

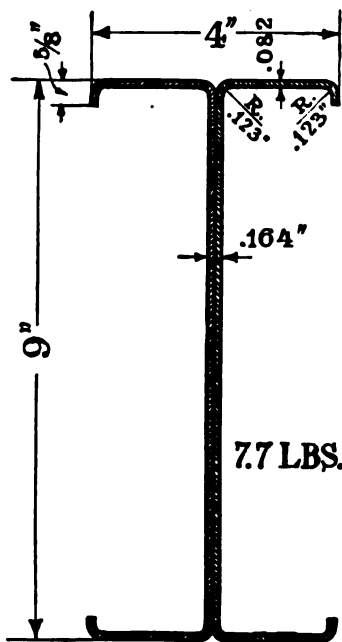
Description—GF Steel Lumber gives economical light weight construction that is permanent, durable, fireproof and soundproof. It provides a construction which eliminates combustible material entirely, with the minimum dead weight on beams and columns, and is a safe, dependable type of construction for erection in all seasons.

Steel Lumber is cut and fabricated ready for use when it arrives on the job and is handled and placed similar to wood joists or studs.

GF Steel Lumber joist sections are made of two absolutely uniform strips, of special steel, formed cold into channel sections and spot-welded together, a process insuring absolute uniformity of size and strength of the finished member. All lengths continuous, no splices.

All GF Steel Lumber is given one coat of oil before fabrication, and after fabrication all sections are dipped in a special graphite paint before shipping to destination.

GF Steel Lumber floor construction consists of pressed steel joists parallel to each other on supporting beams or walls, and secured in position by 1-in. strips of No. 20 gage steel cross bracing, approximately 6 ft. on centers.

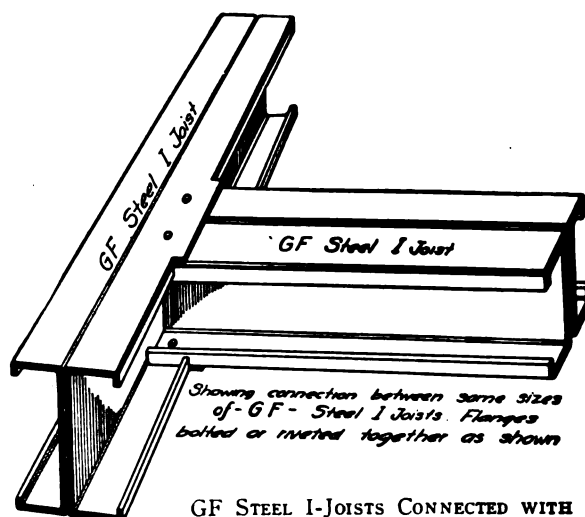


9-IN., 7.7 LB. GF I-JOIST

GF Steel Lumber is furnished in 4-, 5-, 6-, 7-, 8-, 9-, 10-, 11- and 12-in. floor joist and 4-in. channels and I's for studding.

Specifications—Metal Lath—Over joists a layer of Herringbone metal lath or Diamond Rib Lath is to be placed to support and reinforce the concrete slab, in which wooden floor screeds are embedded. (If cement finish or tile floor is desired, screeds to be omitted; in which case a richer mix of concrete shall be used for top slab.) Herringbone lath or Diamond Rib Lath on top of joist to be attached by driving large head 6d roofing nails through lath directly into joint between the sections of joist or by special clips.

For wood floor finish, screeds or nailing strips, approximately 1 1/4 by 1 1/4 in., to be set directly on top of metal lath and along the center line of the joist and attached to joist with 12d nails at frequent intervals. Floor filling to be placed between screeds, lightly tamped or pressed in place and neatly



GF STEEL I-JOISTS CONNECTED WITH BOLTS OR RIVETS

levelled off flush with their surface. Wood finish floor is then nailed directly to screeds.

Metal lath under joists to be Herringbone rigid metal lath or Diamond Rib Lath of sufficient weight to support 3/4 to 1 in. of plaster ceiling and retain its true position when the ground coat is applied. All metal lath to be given a dip coat of good paint by the manufacturer.

Metal lath for floor and ceiling to be lapped at ends and interlocked at sides. All laps at ends of sheets to come at steel joists. Ceiling lath under joists to be secured by special clips.

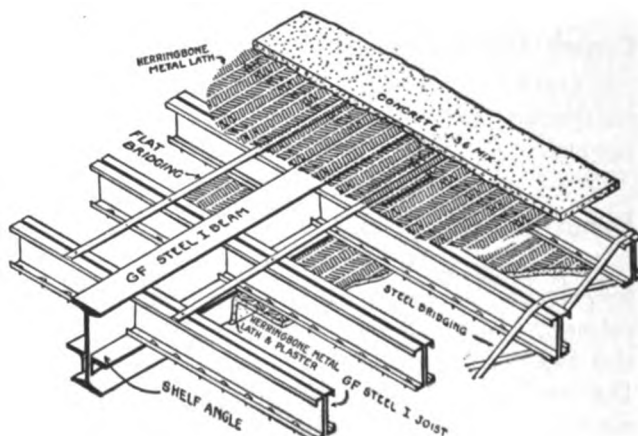
FLOOR FILLING—Floor lath to be covered with floor filling as specified, if a wood top floor is used. If cement finished floor is desired, use 1-2-4 concrete for top slab with cement finish.

SPACING—In no case shall joists in floor construction, or any studs in bearing partition construction, be spaced more than 23 1/2 in. center to center. In roof construction, where metal lath and a concrete slab are used above the steel joists, joists shall not be spaced more than 30 in. center to center. Where steel joists are used to support cement tile on flat roofs, spacing of joists may be increased to meet tile requirements, provided joists are tied together at intervals not exceeding 6 ft. on centers by 1/2-in. round steel tie rods securely fastened through joists at each end of rods. Punching of holes for rod connections to be along center of web.

APPROXIMATE WEIGHT OF GF STEEL LUMBER FLOORS

	Weight per sq. ft., lbs.
Wood flooring	3
1 1/4-in. concrete	21
GF steel joists (average)	3
Plaster ceiling	7
Total	34

Above is based on a wood floor finish. For other types of finish make proper correction. Total dead weight will not exceed 40 lbs. per sq. ft. for any standard design of steel joist construction.



GF STEEL LUMBER AND METAL LATH IN PRACTICAL APPLICATION

ESTABLISHED 1884

NORTH WESTERN EXPANDED METAL CO.

TELEPHONES
HARRISON 1701-2-3

GENERAL OFFICES
407 South Dearborn Street
CHICAGO, ILL.

CODE ADDRESS
"KNOBURN"

SALES OFFICES

CAMBRIDGE, MASS., 280 Sidney Street
NEW YORK, N. Y., 350 Madison Avenue at 45th Street
Telephone, Murray Hill 2233
ATLANTA, GA., 716 Forsyth Building
LOS ANGELES, CAL., 501 Stimson Building

MINNEAPOLIS, MINN., 319 Lumber Exchange Building
Telephone, Atlantic 5407
CINCINNATI, OHIO, 307 Masonic Temple
DALLAS, TEX., 1311 Gt. Southern Life Building
Telephone, Y-2575

ST. LOUIS, MO., 1006 Fullerton Building—Telephone, Olive 6159

WORKS: CHICAGO, ILL. and JEANNETTE, PA.

Stocks Carried in all Principal Cities—Write for name of nearest distributor

Products

The NEMCO LINE of EXPANDED METAL PRODUCTS includes:

Nemco Products
TRADE-MARK

ECONO DIAMOND MESH HEAVY EXPANDED METAL, a fabricated reinforcement for concrete and used also for constructing open partitions, machine guards and for many manufacturing purposes.

METAL LATH: Kno-Burn, Eureka, XXth Century, Diamond Mesh, Burial Vault, Pure Iron, P. O. Special, Corrugated and Kno-Fur, T-Rib Chancelath, Longspan and Econo Sheathing.

NEMCO PRESTEEL LUMBER.

Also, Nemco Lath Accessories, including Cold Formed Channels, Corner Bead, Wall Ties, Picture Mould, Base Screed, Base Ground and Tie Wire.

Catalogues, Samples and Reports of Tests

Complete information, results of recent scientific thermal conductivity, fire, deflection tests, tables of sizes, weights and specifications, etc., for the various Nemco products will be found in the following handbooks sent free on request:

"Designing Data" for reinforced concrete (using Econo Reinforcing); "Fireproof Construction" (covering the use of Metal Lath for interior plastering, stuccoing, fireproofing and ratproofing); "Formless Concrete Construction" (using T-Rib Chancelath).

Consult Our Engineering Department

Our engineers will, without obligation, gladly advise on specific problems involving the use of any Nemco product.

Econo Expanded Metal

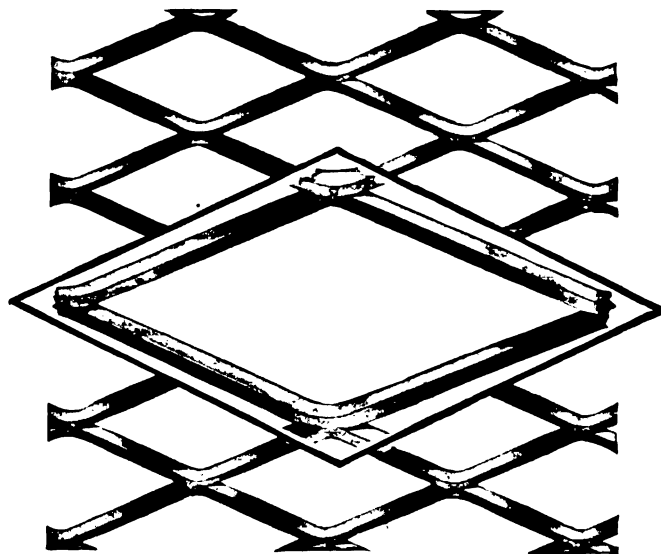
A fabricated or mesh reinforcement for concrete floors, walls, roofs, bridges, culverts, tanks, sewers, porch floors; also used for fireproofing columns, etc.

ECONO
TRADE-MARK

The smaller meshes are used for the construction of machine guards, open partitions and many specialties.

Advantages—In concrete work the use of Econo effects a considerable saving of time and labor; affords

assurance that the correct amount of steel is used and that once properly placed it will retain its specified position; equalizes the distribution of stresses, thus affording pro-



ECONO EXPANDED METAL REINFORCING

PARTIAL LIST OF STOCK SIZES AND WEIGHTS OF ECONO EXPANDED METAL REINFORCING

Number	Area per 12 in. of width sq. in.	Weight per sq. ft., lbs.	Mesh and gauge	Widths, ft.	Lengths, ft.
06-3	.06	.20	3"-16 gauge	6	8 and 12
10-3	.10	.34	3"-13 gauge	4	8 and 12
15-3	.15	.51	3"-10 gauge	7	8, 10, 12
16-3	.16	.55	3"-10 gauge	6½	8, 10, 12
176-3	.176	.60	3"-10 gauge	6	8, 10, 12
20-3	.20	.68	3"-10 gauge	5½	8, 10, 12
25-3	.25	.85	3"-10 gauge	4¾	8, 10, 12
30-3	.30	1.02	3"-10 gauge	7	8, 10, 12
35-3	.35	1.19	3"-10 gauge	6	8, 10, 12
40-3	.40	1.36	3"-7 gauge	7	8, 10, 12
10-2¼	.10	.34	2¼"-16 gauge	5	8 and 12
15-2¼	.15	.51	2¼"-13 gauge	4¾	8 and 12
265-2¼	.265	.90	2¼"-9 gauge	4½	8 and 12

For complete table of stock sizes, send for the handbook "Designing data."

Note: The steel area of each style of Econo is used as part of the number designating the style. Thus 15-3 Econo has 15/100 sq. in. of steel for every 12 in. in width of the material measured across the short dimension of the diamond.

tection against shocks, explosions, the effect of concentrated loading, etc. (which would be disastrous to straight line reinforcement); bonds perfectly with the concrete; utilizes the maximum strength of the steel; does not require constant supervision or highly skilled labor in placing.

Description—Econo expanded metal is a fabric of diamond shaped meshes cut and expanded from medium open hearth sheets, having a tensile strength of from 55,000 to 60,000 lbs., an elastic limit of not less than one-half its ultimate strength and a cold bending test of 180°. Because of the cold working process of manufacture, Econo combines the elasticity of high carbon steel with great ductility and uniformity of quality.

Large Flat Sheets, Easily Secured in Place—

The sheets of Econo lie flat, without waves or warps, do not require stretching and are very rigid. They lie naturally in the plane of tension designed for them, are securely held in place by simply fastening them at a few points in the sheet, while the possibility of failure of the bond where the sheets are lapped is minimized because the stress is carried by a large number of small members. A concentrated load at any point immediately puts in tension all the adjoining meshes—the stress in turn being resisted by the concrete within the diamonds.

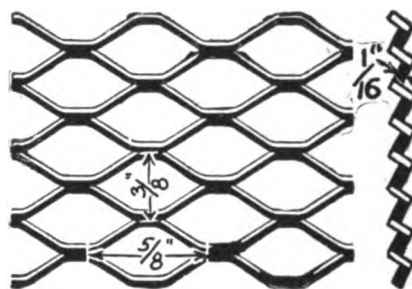
Expanded Metal Lath

An economical, permanent, fire resisting steel base and reinforcement for plaster (interior or stucco) which prevents streaking and cracking of the plaster, and in conjunction with incombustible plaster, constitutes an adequate and economical fire protection for wood joist construction. It is also particularly indicated in construction of suspended ceilings, 2-in. solid partitions, fire stopping, ratproofing, elevator shafts, for beltways, etc., and for fireproofing columns. Nemco expanded metal products come in flat sheets which do not require stretching, are rigid yet easily cut, shaped and plastered. The small diamond mesh provides a perfect

“key” and prevents waste of plaster and there is a perfect bond between the adjacent strands which can not be broken in handling.

Kno-Burn Metal Lath

A fire-resisting, permanent base for all plastering type made. Very economical in use of plaster. Flat, rigid sheets of convenient size, easily cut and shaped and has a fine smooth plastering surface. Furnished painted, cut from pure iron or galvanized sheet, or galvanized after. Sheets are 24x96 in. Packed 9 sheets (16 yds.) to bundle.



ACTUAL SIZE OF MESH OF KNO-BURN EXPANDED METAL LATH

GAUGES AND WEIGHTS OF KNO-BURN LATH

Gauge No.	24	25	26	27
Weight sq. yd., lbs.	3.4	3.0	2.5	2.33
Weight bdl., lbs.	54.4	48.0	40.0	37.3

XXth Century

A small diamond meshed flat plastering lath and reinforcement cut from copper bearing sheet, hence particularly satisfactory for use with patent plasters and in warm, damp climates, etc. Rigid, yet of uniform pliability. Furnished in same gauges, weights and sizes as Kno-Burn.

Reg. U. S. Pat. Off.

XXth CENTURY
TRADE-MARK

GAUGES AND WEIGHTS OF XX CENTURY LATH

Gauge No.	24	25	26	27
Weight sq. yd., lbs.	3.4	3.0	2.5	2.33
Weight bdl., lbs.	54.4	48.0	40.0	37.3

Eureka

Has a $\frac{3}{4} \times \frac{7}{8}$ -in. mesh. Very economical for 2-in. solid partitions, ornamental plastering and other work not requiring very small meshed lath. No. 24 gauge sheets measure 22x96 in. ($14\frac{2}{3}$ yds., 9 sheets) to bundle. No. 26 gauge sheets are 21x96 in. (14 yds., 9 sheets to bundle). Painted, or cut from pure iron, copper bearing sheet or galvanized sheet, or galvanized after.

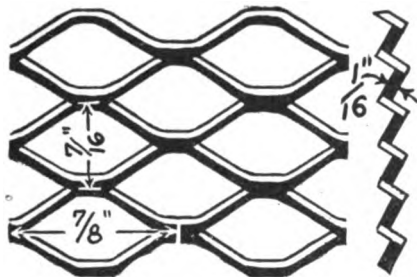
Reg. U. S. Pat. Off.

EUREKA
TRADE-MARK



TRADE-MARK

“The Steel Heart” of plaster. Stops fire, prevents plaster cracks.



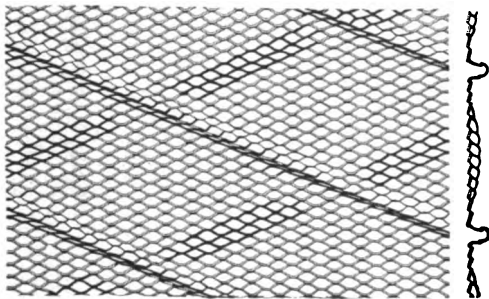
ACTUAL SIZE OF MESH OF EUREKA LATH

GAUGES AND WEIGHTS OF EUREKA LATH

Gauge No.	24	26
Weight sq. yd., lbs.	2.8	2.2
Weight bdl., lbs.	41.1	30.8

Kno-Fur (Self-furring)

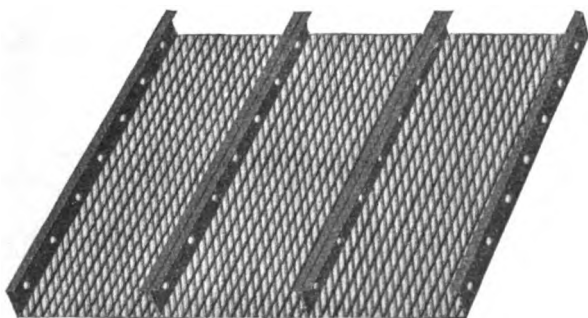
Furnished in Nos. 24, 26 and 27 gauges. Cut from copper bearing or standard steel sheets; 9 sheets to the bundle.



KNO-FUR (SELF-FURRING) PLASTERING LATH

T-Rib Chancelath

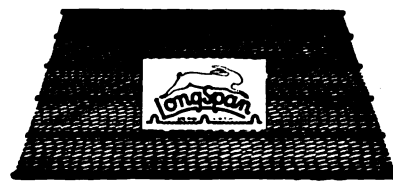
Used as a combined form and reinforcing for concreting, or as a self-furring plastering lath. Heavy cold formed $\frac{7}{8}$ -in. T-shaped ribs spaced 4 in. on centers are connected by a $\frac{3}{8} \times \frac{5}{8}$ -in. steel mesh of the Kno-Burn type. Furnished in lengths of 3 to 12 ft., and in widths of from 4 to 48 in. Shipped painted and crated. Nos. 24, 26 and 28 gauges. Weight per square foot, respectively, .89, .67 and .56 lbs.



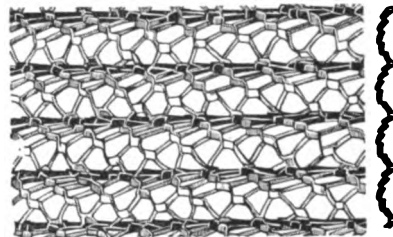
T-RIB CHANCELATH

Long Span

A $\frac{3}{8}$ -in. U-rib or self-furring lath furnished in Nos. 24, 26 and 28 gauges. The stiffest lath of its type made. Sheets 2 ft. x 8 in., 9 to bundle, painted. Shipped uncrated.

LONG SPAN $\frac{3}{8}$ -IN. "U"-RIB LATH**Corrugated (Self-furring) Lath**

Furnished in either Kno-Burn, XXth Century or Eureka types of mesh, and in the same weights, gauges and sizes.

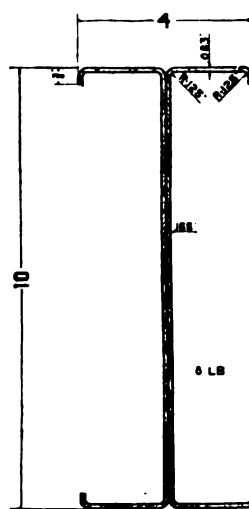


CORRUGATED (SELF-FURRING) LATH

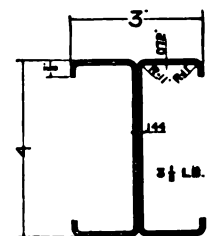
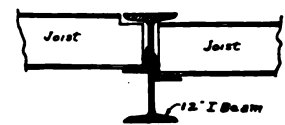
Nemco Presteel Lumber

In connection with Kno-Burn metal lath or Chancelath, Nemco Presteel Lumber provides a simple, light weight and most economical type of permanent, fire-proof construction for all light occupancy structures. Nemco Presteel Lumber can be erected without special tools; in any weather men can work and does not require constant inspection.

Nemco Presteel Lumber Channels and I-sections of cold rolled steel are furnished in 3-, 5-, 6-, 7-, 8-, 9-, 10-, 11-, and 12-in. sizes and in lengths up to 100 ft., without splicing. Shapes cut to dimensions from mill lengths.



10-8 LB I JOIST



4-3 1/2 LB I JOIST

SHOWING SECTIONS OF PRESTEEL LUMBER

TRUSCON STEEL COMPANY

Manufacturers of Reinforcing Steel and Specialties

YOUNGSTOWN, OHIO

For Branch Offices, see page 201.

Products

REINFORCING STEEL; KAHN TRUSSED BARS; RIB BARS; RIB METAL; COLUMN HOOPING; STEEL FLORETYLES and FLOREDOMES; WIRE MESH; CONCRETE INSERTS; CONTRACTION JOINTS; CURB BARS; PRESSED STEEL LUMBER; HY-RIB REINFORCEMENT and LATH; CORNER BEADS; BASE SCREDS.

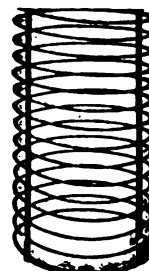
For Steel Sash, see pages 201-203; for Steel Buildings, see page 244.

Collapsible Column Hooping

Accurately constructed column reinforcement, shipped flat in coils of exact diameter attached to spacing bars, ready for field erection. Sizes as follows:

Diameter of wire, in.	1/4	3/8	1/2	3/4
Area, sq. in.	.0491	.0767	.1105	.1963
Wt. per sq. ft., lbs.	.167	.261	.376	.668

Diameter of coils—9 in. to 36 in.
Pitch of coils—1 1/4 in. to 12 in.



COLUMN HOOPING



TRADE-MARK

Service

Owing to the wide range of detail of these products and the value of the technical experience of the company, it is suggested that engineers and architects avail themselves of the service offered by our corps of engineers that is at all times ready to furnish suggestions, estimates and details.

The following is necessarily only an outline of products and not an attempt to suggest their wide application and extensive use.

Kahn Trussed Bars

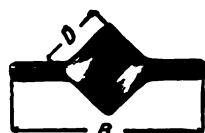
Open hearth steel, concrete beam, girder, floor and arch reinforcement. Unit bars with 45° rigid diagonals formed from flanges on the main body producing 12% to 30% stronger beams than loose stirrups; save steel in design, labor in installation; safe; strong; fireproof and shockproof.



RIGID CONNECTION

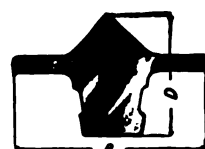


KAHN TRUSSED BAR



SECTION KAHN TRUSSED BAR

D & B in.	Wt. per lin. ft.	Area, sq. in.
1 1/2 x 1 1/4	1.4 lbs.	0.41
1 3/4 x 2 3/4	2.7 lbs.	0.79



SECTION KAHN TRUSSED BAR

D & B in.	Wt. per lin. ft.	Area, sq. in.
1 1/2 x 2 1/4	4.8 lbs.	1.41
1 3/4 x 2 3/4	6.8 lbs.	2.00
2 x 3 1/2	10.2 lbs.	3.00



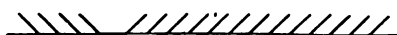
STANDARD SHEAR
Middle portion left unsheared



CENTER SHEAR
Entire bar sheared to center



ONE-WAY SHEAR
All diagonals sheared, inclining in one direction



SPECIAL SHEARING
As directed by purchaser
LENGTH OF DIAGONALS

Size, in.	Standard lengths, in.	*Special lengths, in.
1 1/2 x 1 1/4	12	(6) 8 (18)
1 3/4 x 2 3/4	12, 24	8 (18) 30
1 1/2 x 2 1/4	12, 24, 36	8 (18) 30
1 3/4 x 2 3/4	36	(24) 30 (48)
2 x 3 1/2	36	(24) 30 (48)

* NOTE—The special lengths enclosed in parentheses are ordinarily available only for items of 5 tons or more

Rib Bars

Special rolled steel section with series of cross ribs to secure maximum grip. Carried in stock in warehouses in various cities, furnished straight or bent as ordered.

PROPERTIES OF RIB BARS

Area, in.	Equivalent to	Wt. per ft., lbs.
.110	3/8-in. Round	.379
.196	1/2-in. Round	.674
.250	5/8-in. Square	.86
.307	3/4-in. Round	1.054
.442	7/8-in. Round	1.517
.601	1-in. Round	2.065
.785	1 1/8-in. Round	2.697
1.000	1 1/4-in. Square	3.46
1.266	1 1/2-in. Square	4.38
1.563	1 3/4-in. Square	5.41



SQUARE RIB BAR



ROUND RIB BAR

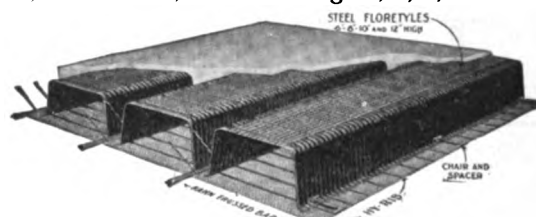
Floretiles

Rows of specially formed steel tiles, separated by reinforced concrete joists and covered with thin layer of concrete, produce strong, deep, light weight, long span floor construction with flat ceilings; require but inexpensive centering and are soundproof. Accuracy of spacing assured by special spacer-chairs. 3/8-in. Hy-Rib metal lath used for ceilings.

Furnished in two types: ribbed and corrugated.

(1) **Ribbed Steel Floretyle**—Ribbed with deep stiffening ribs across top, corrugated sides, rounded corners, corrugated flanges.

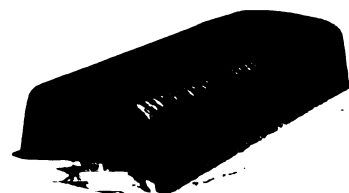
Approximate width at base, 20 1/2 in.; standard lengths, 3 and 4 ft.; standard heights, 6, 8, 10 and 12 in.



RIBBED STEEL FLORETYLES

(2) **Corrugated Steel Floretyle**—Corrugated, with deep corrugations extending completely around tile; corrugated flanges.

Approximate width at base, 20 1/2 in.; standard lengths, 2 ft. 4 1/2 in. and 3 ft. 9 in.; standard heights, 6, 8, 10 and 12 in.



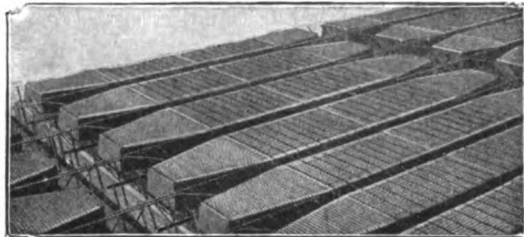
CORRUGATED STEEL FLORETYLE

Cantilever Florestyle—In this construction, the end Florestyles are tapered so as to provide a maximum width of joists at the supports.

The joist is reinforced to act as a cantilever for a considerable distance from the support, assuring longer span without increase or depth, as well as maximum economy of materials.

Cantilever Florestyles are used with either the ribbed or corrugated types of Florestyle.

Standard heights, 6, 8, 10 and 12 in.; approximate width at wide end, 20½ in.; at narrow end, 13¾ in.; lengths (nominal) 2, 3 and 4 ft.



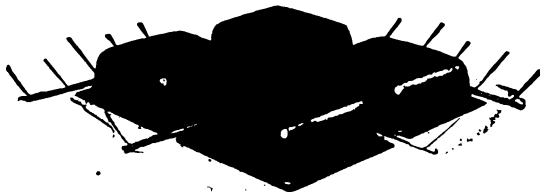
CANTILEVER FLORESTYLES

Truscon Removable Floredomes

Truscon removable Floredomes have the advantages of Florestyle, but are adapted to two-way construction in which the loads are carried in two directions to the supports. As the Floredomes are removable they can be used repeatedly and thus reduce the cost of forms.

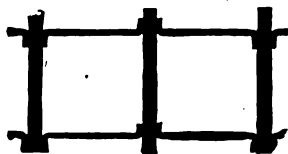
Truscon removable Floredomes are formed from No. 16 gauge sheets by powerful presses and are absolutely uniform and exact. Their smooth, true surfaces make them especially easy to remove after the concrete has set.

Thickness of metal, No. 16 gauge; standard heights, 6 and 8 in.; size over all, 22 by 22 in.; size at base, exclusive of 1-in. flanges on all sides, 20 by 20 in.



TRUSCON REMOVABLE FLOREDOMES

Rib Metal



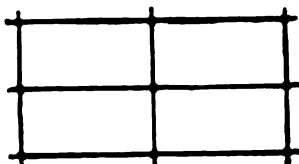
RIB METAL

A unit reinforcement, equivalent to a large number of separate bars. Provides perfect cross reinforcement against temperature and shrinkage strains.

PROPERTIES OF RIB METAL

Size No.....	2	3	4	5	6	7	8	12
Width of sheet, in	16	24	32	40	48	56	64	96
Area per foot of width, sq. in.....	.450	.300	.225	.180	.150	.128	.113	.075

Truscon Wire Mesh



TRUSCON WIRE MESH

A superior reinforcement for concrete roads. Furnished either in rolls with 18-in. core or in flat sheets cut to length; various weights.

Truscon Inserts

Used in concrete slabs, beams or columns for attaching shaft hangers, fixtures, sprinkler systems, etc. Obviate expensive drilling into concrete in finished building. Built into concrete during construction

TRUSCON SLOTTED INSERT
Standard lengths 18, 24, 36 and 60 in.

by fastening to wood centering. Concrete thoroughly embeds insert and holds it rigidly in place. Only narrow slot flush with concrete is seen in completed work.

TRUSCON
ADJUSTABLE
INSERT
½, ¾ and 1 in.TRUSCON
TAPPED
INSERT
½, ¾ and 1 in.

Truscon Dowel Contraction Joint

Used in concrete roads to form a plane of weakness for joint. Plates beveled to crown of road and doweled to provide stiffness.

TRUSCON DOWEL CON-
TRACTION JOINT

Truscon Curb Bars and Edge Protectors

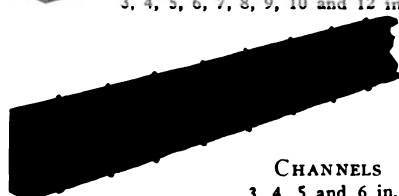
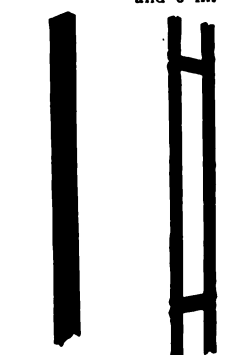
Protect corners of concrete construction. Unit of protecting plate and positive anchorage. Furnished in two sizes, either straight or curved.



TRUSCON CURB BAR

Truscon Steel Joist Construction

A light weight, fire resisting construction consisting of pressed steel beams and studs combined with Hy-Rib metal lath for floors and walls. Ideal for light occupancy buildings such as stores, apartments, hotels, hospitals, institutions, residences, etc. Simple to erect, soundproof, verminproof and economical in cost. Sections furnished in a large variety of shapes, sizes, and gages. Prongs on flanges for attaching Hy-Rib.

I-BEAM
3, 4, 5, 6, 7, 8, 9, 10 and 12 in.H STUD
3, 4, 5 and 6 in.CHANNEL
STUD
2, 3, 4, 5 and 6 in.CHANNELS
3, 4, 5 and 6 in.CAPS AND SILL PLATES
For studs of 2, 3, 4, 5 and 6 in.CHANNELS
¾, 1, 1½ and 2 in.
HOLLOW
STUD
2, 3 and 4 in.

Hy-Rib Metal Lath

Hy-Rib is a reinforcement obtained by shearing and pressing sheet steel, making a unit of lath and stud. The ribs eliminate forms and save studs in concrete and plaster work, reducing cost and simplifying construction, saving labor, time and expense. Used in construction of floors, roofs, walls, sidings, partitions, ceilings, furring, tanks, sewers, culverts, conduits, etc.



1 1/8-IN. HY-RIB

DIMENSIONS OF HY-RIB

Type of Hy-Rib	Height of ribs	Spacing of ribs	Width of sheets	Gauge Nos. U. S. Standard
1 1/8"	1 1/8"	4"	28"	24, 26, 28
3/8"	3/8"	4"	24"	24, 26, 28

Standard lengths, 6, 8, 10 and 12 ft. Other lengths cut without charge except for waste.



3/8-IN. HY-RIB LATH

3/8-in. Hy-Rib Lath—

A self-furring lath, permits wide spacing of studs and saves channels and wiring.

Width of sheets, 24 in. Standard lengths, 6, 8, 10 and 12 ft.

Shipped in bundles of 18 sheets.

3/8-IN. HY-RIB LATH

Wt. per sq. yd., lbs.	Gauge No.	Stud spac. for walls and partitions, in.	Spac. of supports for ceilings, in.
3.0	28	24 to 30	23 to 26
3.6	26	32 to 36	30 to 33
4.8	24	36 to 42	33 to 35

MAXIMUM SPANS FOR 1 1/8-IN. HY-RIB AS CENTERING TO SUPPORT WET CONCRETE

Maximum spans for centering	Gauge 1 1/8 Hy-Rib	Thickness of slabs above base of Hy-Rib	Maximum spans for centering	Gauge 1 1/8 Hy-Rib	Thickness of slabs above base of Hy-Rib
3'-3"	28	2" thick slab, weight 24 lbs. per sq. ft.	2'-6"	28	3 1/2" thick slab, weight 42 lbs. per sq. ft.
3'-6"	26		2'-9"	26	
4'-0"	24		3'-0"	24	
3'-0"	28	2 1/2" thick slab, weight 30 lbs. per sq. ft.	2'-4"	28	4" thick slab, weight 48 lbs. per sq. ft.
3'-3"	26		2'-6"	26	
3'-8"	24		2'-10"	24	
2'-9"	28	3" thick slab, weight 36 lbs. per sq. ft.			
3'-0"	26				
3'-4"	24				

For greater spans use temporary supports.

SAFE LOADS IN LBS. PER SQUARE FOOT FOR SLABS REINFORCED WITH 1 1/8-IN. HY-RIB

(Safe loads include weight of slab. For safe live loads, deduct weight of slab)

Thickness of slabs above base of Hy-Rib	Gauge 1 1/8 Hy-Rib	Moment of resistance per ft. of width	Span in feet								
2" thick slab, weight 24 lbs. per sq. ft. . . .	28	3533	3	4	5	6	7	8	9	10	11
	26	4241	327	185	117	82					
	24	5647	392	221	141	97					
2 1/2" thick slab, weight 30 lbs. per sq. ft. . . .	28	4590	522	294	188	132					
	26	5513	424	239	153	106	78	59			
	24	7346	510	287	183	127	93	71			
3" thick slab, weight 36 lbs. per sq. ft. . . .	28	5648	681	383	245	171	125	95			
	26	6773	522	294	187	131	96	73			
	24	9023	627	353	225	158	115	87	69		
3 1/2" thick slab, weight 42 lbs. per sq. ft. . . .	28	6705	835	469	300	209	153	117	91		
	26	8044	620	349	220	155	113	87			
	24	10721	742	417	268	186	137	104	82		
4" thick slab, weight 48 lbs. per sq. ft. . . .	28	7763	992	558	356	249	182	140	110	89	
	26	9304	718	403	259	180	132	101	80		
	24	12409	864	485	310	216	158	121	97	77	
			644	413	288	212	162	128	103	86	

B. M. = $\frac{1}{10} w l^2$ For B. M. = $\frac{1}{12} w l^2$, add 20% to above loads.

For B. M. = $\frac{1}{8} w l^2$, deduct 20% from above loads.

No. 1-A Hy-Rib Lath—Saves plaster; permits wide stud spacing; has rigid surface and perfect key.

NO. 1-A HY-RIB LATH

Grade	Wt. per sq. yd., lbs.	Stud spac. for walls, c to c	Joist spac. for ceilings, c to c
No. 1-A	3.20	16" to 28"	14" to 24"

Size of sheets, 18x96 in. Shipped in bundles containing 15 sheets or 20 yards.

TRUSCON DIAMOND LATH

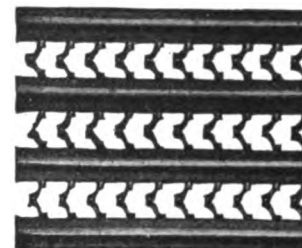
Gauge No.	Sheets per bundle	Sq. yds. per bundle	Weight per sq. yds., lbs.	Painted	Galv.
27	10	20	2.33	2.50	
26	10	20	2.55		
25	10	20	3.00		
24	10	20	3.40		
22	15	26 2/3	4.20		

Size of sheets, 27x96 in.

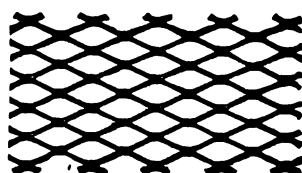
UNIVERSAL DIAMOND LATH

Gauge No.	Sheets per bundle	Sq. yds. per bundle	Weight per sq. yds., lbs.
26	10	20	2.20
24	10	20	2.80

Size of sheets, 27x96 in.



1-A HY-RIB LATH



DIAMOND LATH

Standard Rib Lath

A ribbed steel lath of medium weights generally useful in building work.

STANDARD RIB LATH

Grade of rib lath	Wt. per sq. yd., lbs.	Stud space for walls, c to c	Joist space for ceilings, c to c
No. 2	2.70	14" to 16"	12" to 14"
No. 4	3.20	16" to 20"	14" to 16"

Size of sheets, 27x96 in. Shipped in bundles containing 15 sheets or 30 yds.

SOLID PARTITIONS WITH HY-RIB AND WITHOUT CHANNELS

Height of partitions, ft.	Thickness, in.	Reinforcement
10	1 1/4	No. 28 1 1/8" Hy-Rib
12	2	No. 28 1 1/8" Hy-Rib
14	2 1/4	No. 28 1 1/8" Hy-Rib
16	2 1/2	No. 28 1 1/8" Hy-Rib
18	2 3/4	No. 26 1 1/8" Hy-Rib
20	3	No. 26 1 1/8" Hy-Rib

SOLID PARTITIONS WITH HY-RIB LATH AND CHANNELS

Spacing of channels, in.	Metal Lath
12 to 14	Diamond lath, 2.2 to 3.0 lbs. or 1-A Hy-Rib lath
14 to 16	Diamond lath, 3.00 to 3.4 lbs. or Std. lath No. 2
16 to 28	1-A Hy-Rib lath
16 to 20	Std. lath No. 4
24 to 30	3.0 lb. 3/8" Hy-Rib lath
32 to 36	3.6 lb. 3/8" Hy-Rib lath
36 to 42	4.8 lb. 3/8" Hy-Rib lath

1/8-HY-RIB CEILINGS

Spacing of supports, in.	Reinforcement
12 to 14	Diamond lath, 2.2 to 3.0 lbs. or Std. lath No. 2
14 to 16	Diamond lath, 3.0 to 3.4 lbs. or Std. lath No. 4
16 to 23	1-A Hy-Rib lath or Std. lath No. 4
23 to 28	3.0 lb. 3/8" Hy-Rib lath
30 to 33	3.6 lb. 3/8" Hy-Rib lath
33 to 35	4.8 lb. 3/8" Hy-Rib lath
36 to 47	No. 28 1 1/8" Hy-Rib
48 to 59	No. 26 1 1/8" Hy-Rib
60 to 71	No. 24 1 1/8" Hy-Rib

1/8-HY-RIB SIDE WALLS

Spacing of supports, in.	Thickness of wall, in.	Reinforcement
14	1 1/4	Diamond lath, 2.2 to 3.0 lbs. or Std. lath No. 2
18	1 1/2	Diamond lath, 3.0 to 3.4 lbs. or Std. lath No. 4
24	1 3/4	1-A Hy-Rib lath or 3.0 lb. 3/8" Hy-Rib lath
32	1 3/4	3.6 lb. 3/8" Hy-Rib lath
42	1 3/4	4.8 lb. 3/8" Hy-Rib lath
72	1 3/4	No. 28 1 1/8" Hy-Rib
96	2	No. 26 1 1/8" Hy-Rib
120	2	No. 24 1 1/8" Hy-Rib
144	2 1/2	No. 24 1 1/8" Hy-Rib

Support only their own dead weight.

*Ribs run horizontally.

Corner Beads

Furnished in two styles for the protection of plastered concerns: (1) Detroit T-rail with adjustable clips and (2) rib steel as illustrated.



CORNER BEAD

Metal Base Screeds

Used between cement bases and plastered walls as ground for plaster and cement.



BASE SCREED

WICKWIRE SPENCER STEEL CORPORATION

SUCCESSOR TO CLINTON-WRIGHT WIRE COMPANY

Manufacturers of Clinton Electrically Welded Wire Fabric for Concrete Reinforcement

WORCESTER, MASS.

BUFFALO, N. Y.

Address all communications regarding Welded Wire Fabric to the Buffalo Office

DISTRICT OFFICES

NEW YORK, N. Y., 120 Broadway
BOSTON, MASS., 120 Franklin Street

PHILADELPHIA, PA., 237 North Sixth Street

SAN FRANCISCO, CAL., 111 Townsend Street

CHICAGO, ILL., 215 W. Ontario Street
DETROIT, MICH., 3044 West Grand Boulevard
TULSA, OKLA., 861 Mayo Building

Product

CLINTON ELECTRICALLY WELDED WIRE FABRIC for Concrete Reinforcement.

For Wire Rope, see pages 53-55.

Clinton Electrically Welded Wire Fabric

Scope of Use—Clinton electrically welded wire fabric, a mesh reinforcement, is especially suited for floors, roofs, walls, roads, sidewalks, sewers, reservoirs, levees and all kinds of slab construction. The material is also used to special advantage in all kinds of work involving the covering or protection of steel with concrete, as in buildings, bridges, subways and tunnels.

Material—Clinton electrically welded wire fabric is a wire mesh made up of a series of parallel longitudinal wires, generally spaced at even distances apart and held in position by means of transverse wires arranged at right angles to the longitudinal ones, and securely welded to them at the points of intersection by a patented electrical process.

Wire—Clinton electrically welded wire fabric is manufactured from a special grade of high quality steel wire, possessing such strength, elasticity, and ductility as to render it especially suited to structural use.

The wire will develop an average ultimate strength of 70,000 to 80,000 lbs., with a maximum, in some cases, of 90,000 lbs. per sq. in. or over.

Innumerable tests and investigations which have been made upon welded wire during the past 15 years have proved, beyond the shadow of a doubt, that the process of welding does not in any way lessen the tensile strength of the longitudinal wires. Specimens when tested, whether they break at or between the welds, will invariably show the full tensile strength of the longitudinal wire when compared with the strength of the plain wire before welding.

Electric Weld—In Clinton welded wire fabric the transverse wires are welded to the longitudinal wires by means of an electric current. They are not in any way secured by winding, or by loops or clips, and for this reason the casual observer sometimes concludes that the wires are merely soldered together.



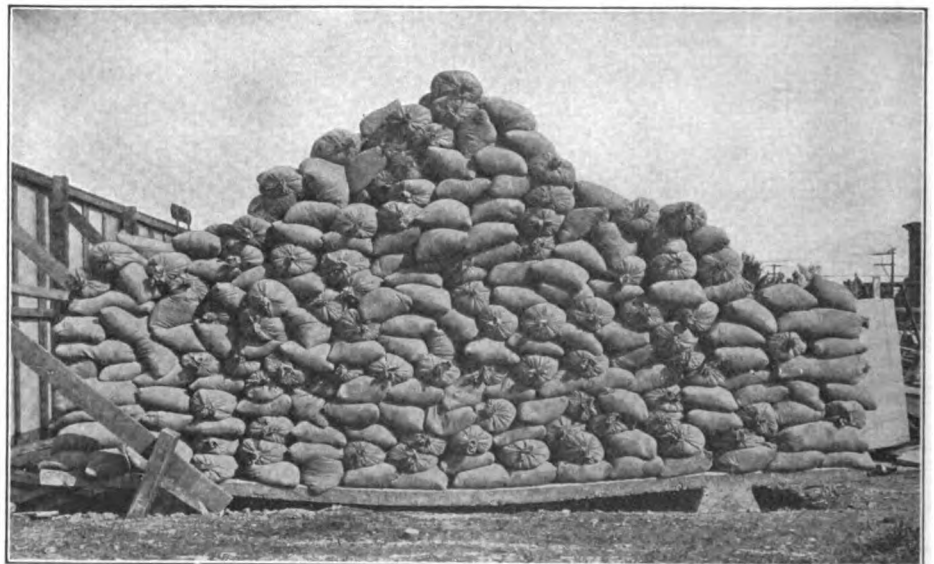
THE CLINTON ELECTRIC WELD

In this view the two wires have been cut through at their point of union, revealing a perfectly smooth surface. It is a perfect weld; the two wires are actually fused together.

This idea is wrong. The connection is made by an absolute and perfect weld, in which the two wires are actually fused into one homogeneous section.

A great number of shearing tests have also been made upon the welded connections, and it has been shown that the shearing strength of one weld in many cases actually exceeds the tensile strength of the longitudinal or heavier wire.

Rectangular Mesh—Clinton welded wire fabric is of rectangular or square mesh. There are no zigzag or diagonal members in the material. When used as reinforcement in floor slabs, the longitudinal members are thus located in the line of tension, while the transverse or secondary members, arranged at right angles to them, afford a most efficient means of distributing concentrated loads in a direction perpendicular to the main reinforcing members. In floor slabs, designed and estimated on the basis of distributed loads, this is a most important factor in enabling a slab to receive a very heavy load on a small area.



TEST OF SLAB REINFORCED WITH CLINTON ELECTRICALLY WELDED WIRE FABRIC
1:2:4 concrete with No. 3 Clinton wires at 3-in. c.c. Span, 12 ft. c.c. Cantilever projection, 3 ft.; width, 4 ft.; thickness, 4 in. Total load, 47,000 lbs. Distributed load, approximately 826 lbs. per sq. ft. at center of slab

Clinton welded wire fabric, affording, as it does, an efficient transverse as well as longitudinal reinforcement, prevents cracking due to changes in temperature and provides a perfect network of steel which knits and binds the concrete together, reinforcing it securely in all directions.

Perfect Bond—There is perfect adhesion or "bond" of concrete to Clinton fabric, because it has no clips or wrapped wires to prevent free flow of the aggregate when it is being poured; therefore, no voids exist in the completed work. Transverse strands, which are of much heavier gauge than can be used in any other wire fabric, are securely welded to longitudinal strands at right angles to the latter, and provide absolute mechanical anchorage against movement of the fabric in the concrete when subjected to strain.

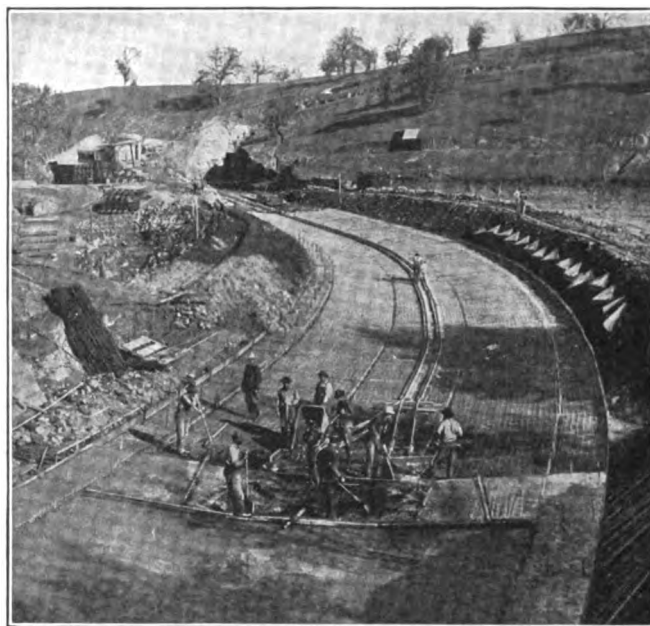
Unbroken Continuity—Fabric is delivered in rolls and may be laid in continuous sheets up to 200 ft. in length. The result is no waste, no lapped ends, no weak points.

Economy and Accuracy of Installation—The use of welded wire eliminates all cost and trouble involved in the spacing and wiring of loose members. Spacing is established by machinery, and it is impossible for the relative position of various members to become changed in the slightest degree.

The fact that great quantities of material can be laid accurately in a very short time by unskilled labor, with absolute assurances that every strand of wire is in its proper position, renders welded wire the safest, simplest and most economical reinforcing material for all kinds of slab construction.

Finish—Unless otherwise ordered, Clinton electrically welded fabrics are furnished made with plain steel longitudinal and galvanized steel transverse strands. The price is lower than for fabrics galvanized throughout, the difference being controlled by the market price of spelter used in the galvanizing process.

Galvanizing—Clinton electrically welded fabrics are also made from steel wire, which is thoroughly galvanized before being welded. Galvanizing affords protection against the development of rust if the material is exposed to the weather by reason of delays in its use in the work, or if the concrete is of inferior quality and contains elements injurious to steel, or is so porous as to permit the entrance of moisture or destructive gases.



TURLOCK IRRIGATION DISTRICT, CALIFORNIA

Bed of concrete flume reinforced with Clinton electrically welded wire fabric, 6 x 6-in. mesh, No. 6 and No. 6 wires

PROPERTIES OF WIRE AND SECTIONAL AREA OF FABRICS

Size per W. & M. gauge	Diameter of 1 wire, in.	Sectional area of 1 wire, sq. in.	Weight per lin. ft. of 1 wire, lbs.	Sectional area (sq. in.) of longitudinal wires only in 1 ft. of fabric width when spaced as shown below				
				2-in.	3-in.	4-in.	5-in.	6-in.
No. 0	.3065	.07378	.2506	.4426	.2951	.2213	.1770	.1475
No. 1	.2830	.06290	.2136	.3774	.2516	.1887	.1509	.1258
No. 2	.2625	.05411	.1838	.3246	.2164	.1623	.1298	.1082
No. 3	.2437	.04664	.1584	.2798	.1865	.1399	.1119	.0932
No. 4	.2253	.03986	.1354	.2391	.1594	.1195	.0956	.0797
No. 5	.2070	.03365	.1143	.2019	.1346	.1009	.0807	.0673
No. 6	.1920	.02895	.0983	.1737	.1158	.0868	.0694	.0579
No. 7	.1770	.02460	.0835	.1476	.0984	.0738	.0590	.0492
No. 8	.1620	.02061	.0700	.1236	.0824	.0618	.0494	.0412
No. 9	.1483	.01727	.0586	.1036	.0691	.0518	.0414	.0345
No. 10	.1350	.01431	.0486	.0858	.0572	.0429	.0343	.0286
No. 11	.1205	.01140	.0387	.0684	.0456	.0342	.0273	.0228
No. 12	.1055	.00874	.0296	.0524	.0349	.0262	.0209	.0174

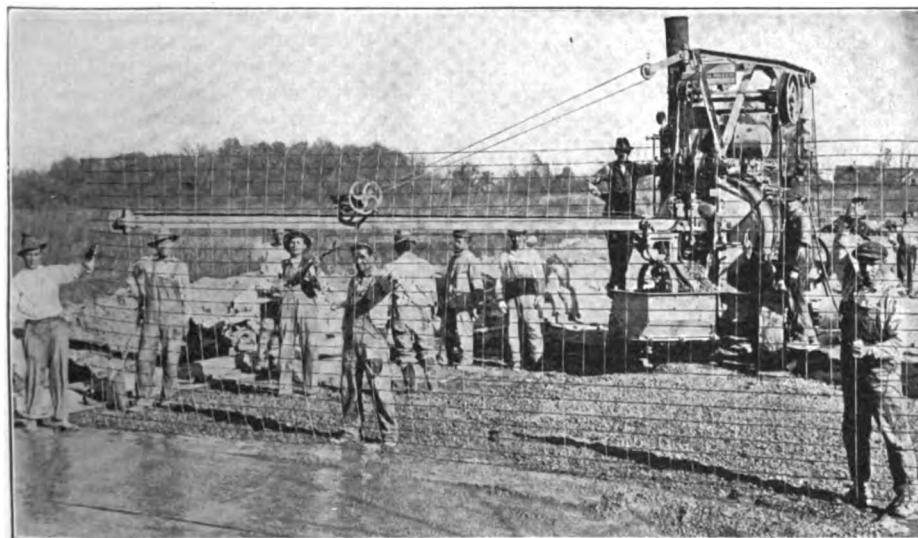
Clinton Wire Fabric for Road Reinforcement

Concrete roads are subjected to severe strains from several different causes, as follows:

(1) **Soft and Hard Areas in Surface Upon Which Pavement is Laid**—These cause positive and negative bending moments in all parts of slab. Even where subsoil is perfectly prepared, conditions may be changed later by surface water or frost.

(2) **Construction and Expansion Due to Changes of Temperature**—Destruction of concrete pavement from this cause was very severe before Clinton wire fabric reinforcement was used in roadwork.

(3) **Frost Heaving**—This action takes place principally along edges of pavement, causing cracks parallel to roadway, being most destructive, but avoided by



CONCRETE ROAD, MADISON, WIS.

Placing a sheet of reinforcement, Clinton electrically welded wire fabric, 4 x 6-in. mesh, No. 6 and No. 10 wires

DESCRIPTION OF STOCK GRADES OF CLINTON ELECTRICALLY WELDED WIRE FABRIC

Longitudinal wires		Transverse wires		Cross-sectional area of longitudinal wires per foot of width of fabric	Weight per 100 sq. ft., lbs.	Description of rolls				Specifications for ordering		
Spacing in.	Size No., W & M gauge	Spacing in.	Size No., W & M gauge			Length, ft.	Width, in.	Sq. ft.	Weight, lbs.	Approximate diameter, inches	Mesh, in.	Gauge of wire
2	3	16	8	.2798	103.64	150	62	775	803	25	2 x 16	3 and 8
2½	3	16	8	.2238	84.63	150	77	962 1/2	815	20	2½x16	3 and 8
3	3	16	8	.1865	71.96	150	86	1075	774	21	3 x 16	3 and 8
3	4	16	9	.1594	61.42	150	86	1075	660	21	3 x 16	4 and 9
3	5	16	9	.1346	52.56	150	86	1075	565	21	3 x 16	5 and 9
3	6	16	10	.1158	45.06	200	86	1433 1/3	646	21	3 x 16	6 and 10
3	7	16	10	.0984	38.87	200	86	1433 1/3	557	20	3 x 16	7 and 10
3	8	12	10	.0824	34.42	200	86	1433 1/3	493	20	3 x 12	8 and 10
3	9	12	11	.0691	28.64	200	86	1433 1/3	411	18	3 x 12	9 and 11
4	3	16	8	.1399	56.12	150	86	1075	603	23	4 x 16	3 and 8
4	6	16	10	.0868	35.23	200	86	1433 1/3	505	20	4 x 16	6 and 10
4	7	16	10	.0738	30.51	200	86	1433 1/3	437	20	4 x 16	7 and 10
4	8	12	10	.0618	27.42	200	86	1433 1/3	393	21	4 x 12	8 and 10
4	9	12	11	.0518	22.77	200	86	1433 1/3	326	18	4 x 12	9 and 11
4	12	12	12	.0262	12.57	400	102	3400	427	24	4 x 12	12 and 12
6	10	6	10	.0286	20.74	300	98	2450	508	30	6 x 6	10 and 10
5	12	9	12	.0209	11.81	400	102	3400	402	24	5 x 9	12 and 12
2	12	2	12	.0524	36.82	300	58	1450	534	30	2 x 2	12 and 12

All foregoing items are made from steel wire galvanized before being welded, or with plain wire in the longitudinal and galvanized wire in the lateral strands. The latter fabrics are less expensive than when galvanized wire is used throughout. In ordering, specify whether plain or galvanized wire is required.

sufficient transverse reinforcement placed near lower surface of slab.

Note: This should not be at expense of longitudinal reinforcement so essential in carrying stresses (Items 1 and 2).

(4) Concentrated Loads—These are imposed on pavement by wheels of heavily loaded vehicles and are often intensified by hammer blow where truck wheels pass over obstacles on roadway. Straight line reinforcement in directions at right angles to each other offers the most effective resistance to this damage.

Damage from above causes can be effectively controlled by proper steel reinforcement. Engineers now generally concede that this can best be effected by a steel wire fabric (whose wires are at right angles and rigidly connected at junction points) of high ultimate strength and modulus of elasticity.



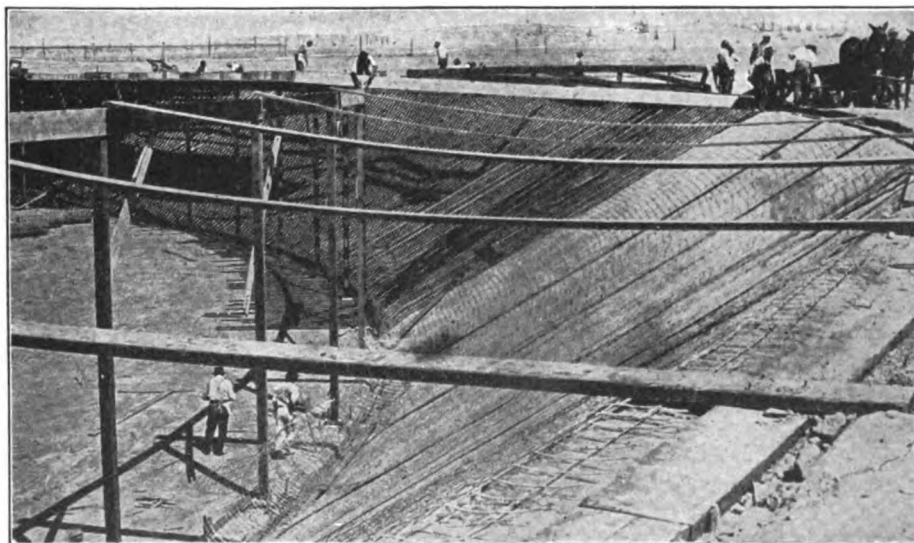
CONCRETE RESERVOIR, COVINA IRRIGATION DISTRICT

Counterforts reinforced with rods, walls and floor reinforced with Clinton electrically welded wire fabric

Clinton electrically welded wire fabric not only presents these advantages, but supplies an absolute mechanical bond with concrete due to rigidly connected transverse wires. It furnishes any required cross-sectional area wire both longitudinally and transversely of the road-bed, with minimum weight per square yard of fabric, thus reducing expense in handling and transportation. Stiffness and rigidity of Clinton fabric make it easy to handle and lay flat. No waste in cutting as every edge is a selvage.

How to Specify Clinton Welded Wire

See last column of table above. Also mention width and length desired in each roll, whether as specified in table, or otherwise. Also state whether galvanized or plain steel finish is required.



OIL RESERVOIR, SOUTHERN PACIFIC COMPANY

Concrete lining reinforced with Clinton electrically welded wire fabric, 6x6-in. mesh, No. 6 and No. 6 wire

THE YOUNGSTOWN PRESSED STEEL COMPANY

Manufacturers of Expanded Metal, Metal Lath and Channels

WARREN, OHIO

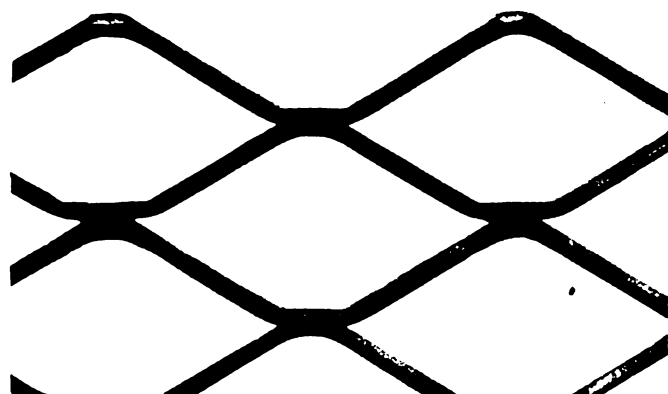
Products

EXPANDED METAL; METAL LATH; COLD FORMED CHANNELS.

Also manufacturers of Crimped Furring, Corner Bead, Base Bead.

Youngstown Expanded Metal

A sheet metal product formed cold at a single operation without waste. Youngstown expanded metal provides the sturdiest and strongest type of reinforcement due to the fact that stresses are absorbed in practically all directions. The larger diamond meets the need of architects, contractors and engineers for reinforcing foundations, floors, roofs, sidewalks, bridges, silos, reservoirs and retaining walls. It gives a higher factor of safety. Furnished in sheets up to 10 ft. in length (meaning the long axis of the diamond) and as large as 15 ft. wide. Youngstown expanded metal covers large areas quickly as sheets are laid in forms without wiring.



YOUNGSTOWN EXPANDED METAL

Sizes of diamonds, and thickness and width of strands can be varied to suit the purpose. The smaller diamond meshes just fit the need for window, elevator, or machinery guards, and hundreds of similar uses.

Youngstown expanded metal is manufactured for concrete reinforcing purposes, in gages from No. 18 gage to $\frac{1}{4}$ in. thickness, and the sizes of diamonds are as follows: 3×7 in., $2\frac{1}{2} \times 5$ in., $1\frac{1}{2} \times 3$ in., $1 \times 2\frac{1}{8}$ in., $\frac{3}{4} \times 2$ in., $\frac{1}{2} \times 1\frac{3}{8}$ in.

The $1 \times 2\frac{1}{8}$ in. is made in gages from Nos. 13 to 18. Nos. 13 to 15 are used largely for locker purposes and for machinery guards; while the lighter, Nos. 16 and 18 gages, are used largely for reinforcing slabs for tile roofing purposes. The other gages and styles mentioned above are used almost exclusively for concrete reinforcement.

It may be pertinent to say that the steel used in the manufacture of Youngstown expanded metal is a special analysis soft steel of high tensile strength which enables the raw material to be expanded into the desired diamonds or meshes without danger of fracturing the strands, thus giving perfect material of full relative strength.

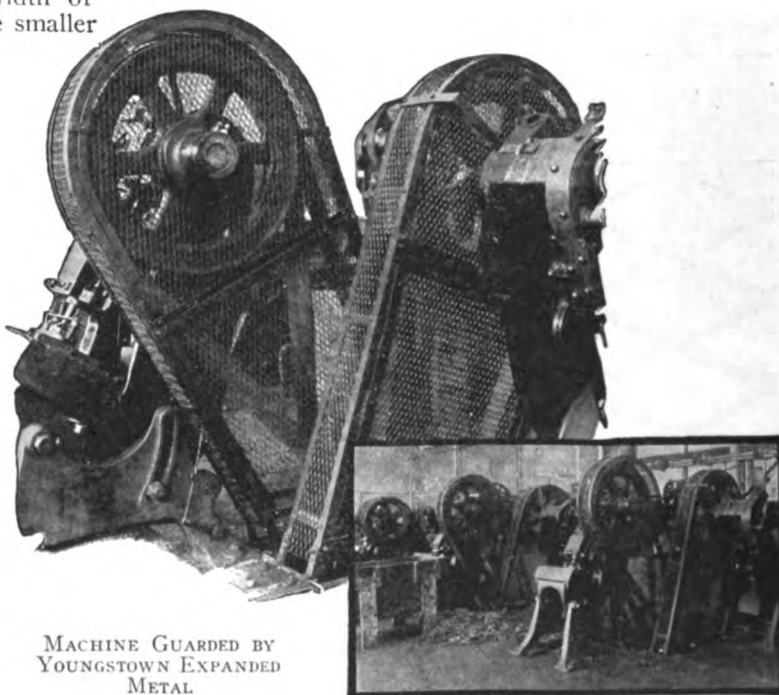
YOUNGSTOWN EXPANDED METAL

Style	Diameter, in.	Sectional area, sq. in.	Weight sq. ft., lbs.	Comparative gage	Standard sizes	
					Width, ft. in.	Length, ft.
3-059-20	3	.059	.20	16	5 4	6, 8, 10
3-082-28	3	.082	.28	12	5 4	6, 8, 10
3-115-39	3	.115	.39	12	5 4	6, 8, 10
3-130-44	3	.130	.44	12	5 4	6, 8, 10
3-147-50	3	.147	.50	10	4 0, 5 3, 8 0	6, 8, 10
3-162-55	3	.162	.55	10	5	6, 8, 10
3-179-61	3	.179	.61	10	5	6, 8, 10
3-251-85	3	.251	.85	10	5	6, 8, 10
3-274-93	3	.274	.93	10	5	6, 8, 10
3-324-110	3	.324	1.10	10	5	6, 8, 10
3-377-128	3	.377	1.28	10	5	6, 8, 10
2 $\frac{1}{4}$ -089-30	2 $\frac{1}{4}$	.089	.30	16	5 3	6, 8, 10
2 $\frac{1}{4}$ -155-52	2 $\frac{1}{4}$	.155	.52	12	5 3	6, 8, 10
1 $\frac{1}{2}$ -108-36	1 $\frac{1}{2}$	.108	.36	16	5 3	6, 8, 10
1 $\frac{1}{2}$ -179-61	1 $\frac{1}{2}$	.179	.61	12	5 3	6, 8, 10
1-084-29	1	.084	.29	18	6 6	6, 8, 10
1-162-55	1	.162	.55	16	6 6	6, 8, 10
1-206-70	1	.206	.70	12	6 6	6, 8, 10
$\frac{3}{4}$ -084-29	$\frac{3}{4}$	.084	.29	18	6 6	6, 8, 10
$\frac{3}{4}$ -162-55	$\frac{3}{4}$	.162	.55	16	6 6	6, 8, 10
$\frac{3}{4}$ -206-70	$\frac{3}{4}$	.206	.70	12	6 6	6, 8, 10
1-226-76	1 $\frac{1}{2}$	.226	.76	18	3 6	8

Expanded Metal for Machine Guards and Factory Partitions—Since the passage of laws in most states requiring protection from moving machine parts such as gears, flywheels and belts, it is no longer a question of whether or not to guard machinery but simply a question of the best material to be used for making the guards.

Youngstown expanded metal has proved ideal for this purpose. Expanded metal is as rigid and impact-proof as solid sheets.

But this material is much better than solid sheets in many ways. For one thing, no light is shut off from any part of the shop and there is no hindrance to ventilation. The machinery is always in full view for constant inspection through the meshes and the oiling can be easily and quickly done without removing the guards. Also, it is



MACHINE GUARDED BY
YOUNGSTOWN EXPANDED
METAL

easy to keep dirt from collecting as it does with solid guards.

Another big advantage of Youngstown expanded metal is that it can be quickly cut, shaped to fit and entirely constructed right on the spot by shop millwrights.

The same outstanding qualities that make Youngstown expanded metal just right for machine guards make it the ideal material for factory partitions, window guards, elevator enclosures and other places that need to be set off for special purposes.

Such partitions allow as much light and air as if there were nothing there at all and it is possible to see through them everything that is going on around the shop. At the same time, the meshes are tough enough to guard against intrusion as completely as would a solid wall.

Such factory partitions are easily and quickly erected by any workman. And the rigidity of the big sheets of Youngstown expanded metal makes wider spacing of the supports possible and this, of course, is an added economy in laying out the shop.

Machine Guard Literature—An illustrated folder showing all the steps in machine guard construction will be sent on request.

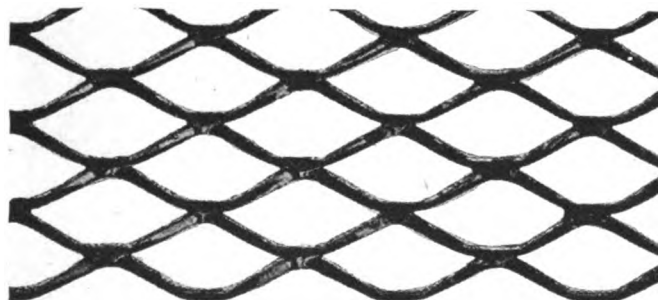
Metal Lath

Metal lath is an effective fire resistant. For durability, metal lath provides an exceptionally firm key for the plaster, removing the possibility of failure through the shearing of the key. Because metal does not absorb moisture, there are no stains or plaster cracks so common with the use of wood lath. Metal lath does not harbor vermin, rats or mice.

Mahoning Metal Lath

Mahoning metal lath has a small, diamond shaped mesh that requires a minimum of plaster. The edges of the lath are cut square so that the lath laps evenly without waste. Every strand becomes thoroughly embedded in the plaster so that corrosion is retarded. This lath is made from the highest grade open hearth steel and is furnished painted, or in copper iron alloy in the sizes shown in the following table:

Gage No.	Size of sheet, in.	Weight per sq. yd., lbs.	Sheets per bundle	Yards per bundle
22	21x97	3.40	9	14
22½	21x97	3.33	9	14
23	21x97	3.10	9	14
24	21x97	2.75	9	14
25	21x97	2.50	9	14
26	21x97	2.20	9	14



MAHONING METAL LATH

Ideal Metal Lath

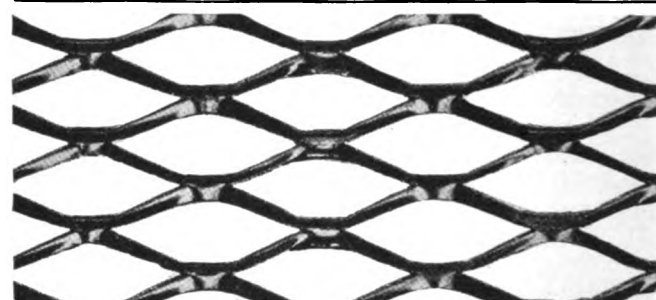
This metal lath, of diamond shaped mesh, is exceedingly rigid, has a wide, uniform strand, meets United States Government specifications and affords a firm, solid base for plastering.

Ideal lath lies flat without hollows or sags. The trowel does not catch on the lath. Mortar is saved

because only a thin plaster coat is required. The edges of the lath are cut square, so that the lath laps evenly without waste.

This lath is furnished painted, or in copper iron alloy in the sizes shown in the following table:

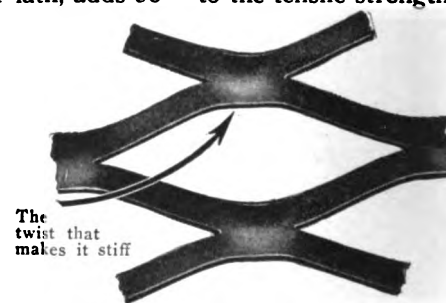
Gage No.	Size of sheet, in.	Weight per sq. yd., lbs.	Sheets per bundle	Yards per bundle
24	21x97	4.00	9	14
25	21x97	3.50	9	14
26	21x97	3.00	9	14



IDEAL METAL LATH

The Twist That Makes It Stiff—The process of cutting and expanding Mahoning and Ideal metal lath in a direction perpendicular to the plane of the raw sheet, both at one operation, gives a twist to the lath at the intersection of the strands. This twist, a feature found in no other lath, adds 50% to the tensile strength, but even more

important, makes the lath itself stiff and rigid. The rigidity of Mahoning and Ideal lath tends to reduce amount of plaster required and eliminate plaster cracks.



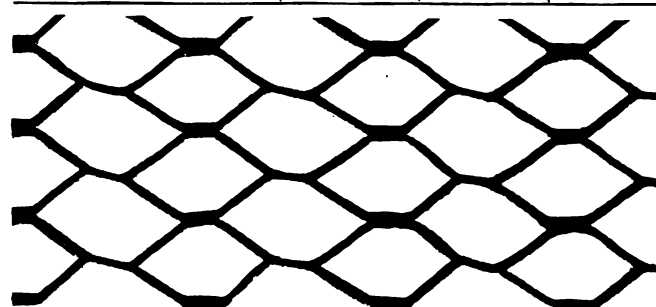
SECTION OF IDEAL AND MAHONING METAL LATH

Warren Metal Lath

Warren metal lath is an expanded steel lath with narrow strands and small openings that requires a minimum amount of plaster. This lath is made of heavier steel for the same weight per yard than most other laths.

Warren lath is furnished painted in all sizes or may be had galvanized in Nos. 26, 24 and 22 gages. This lath is carried in stock in the sizes shown in the following table:

Gage No.	Size of sheet, in.	Weight per sq. yd., lbs.	Sheets per bundle	Yards per bundle
22	21x97	3.4	9	14
23	21x97	3.00	9	14
24	21x97	2.75	9	14
25	21x97	2.5	9	14
26	21x97	2.2	9	14



WARREN METAL LATH

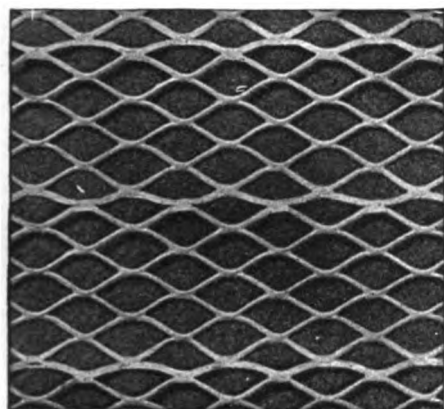
Zee Metal Lath

The most rigid self-furring metal lath for stucco work. On account of its self-furring feature, this lath may be applied directly to the sheathing boards, thereby saving furring and labor and insuring a wall of uniform thickness, which is easily plastered.

Zee metal lath is a product in which a lateral ledge is incorporated at regular intervals throughout the course of the sheet, as indicated by the illustrations. This gives the lath added strength and practically prevents expansion and contraction; at the same time it reduces the amount of stucco required to a safe minimum.

Zee metal lath is furnished in steel, painted black, and in copper iron alloy, painted red, in the gages shown in the following table:

Gage No.	Size of sheet, in.	Weight per sq. yd., lbs.	Sheets per bundle	Yards per bundle
22	21x97	3.40	9	14
23	21x97	3.10	9	14
24	21x97	2.75	9	14
25	21x97	2.50	9	14
26	21x97	2.20	9	14



FRONT AND SIDE VIEWS OF ZEE METAL LATH

Sharon Cold Formed Channels

For wall and column furrings, solid partitions, carrying bars and furring strips for suspended ceilings.

Formed cold, of best quality open hearth steel, producing exceptionally straight and very rigid channels. Can be bent into the most difficult shapes for furring without the steel fracturing.

Sharon cold formed channels provide the best possible method for speedy erection of metal lath, and are lighter because of the uniform thickness produced only by the cold form process.

An important feature of Sharon cold formed channels is the fact that the legs are exactly perpendicular to the web. The corners are rounded, but with a small curve that produces a strong corner but keeps the web and legs perfectly straight without any belly or curvatures.

With the greater tensile strength of special steel cold formed with the lighter weight and the perpendicular legs, a builder can not afford to use other than Sharon straight, rigid, cold formed channels.

Copy will be furnished of Robert W. Hunt & Company's test on 3/4-in. channel for furring and 1-in. channel for carrying bars in suspended ceiling construction.

Plain, in stock lengths 12 to 20 ft., in standard No. 16 gage, or if required, in Nos. 14 to 18 gage, leg lengths either 3/8 or 1/2 in. Also furnished perforated.

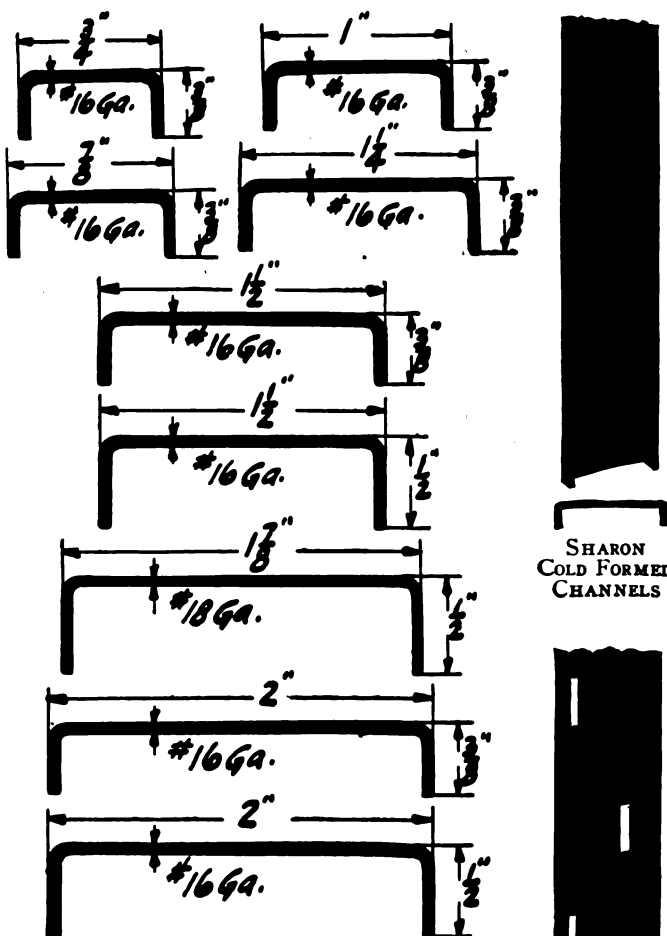
Plain channels manufactured in the sizes shown in the following table:

SHARON PLAIN COLD FORMED CHANNELS

Gage No.	Size of web or back, in.	Size of flange or leg, in.	Weight per 1000 lin. ft., lbs.
16	3/4	3/4	276
16	3/4	3/4	304
16	1	3/4	332
16	1 1/4	3/4	387
16	1 1/2	3/4	456
16	1 3/4	3/4	525
18	1 3/4	3/4	458
16	2	3/4	580
16	2	3/4	635

Stock lengths, 12, 14, 16, 18 and 20 ft.; longer or special lengths can be furnished on special orders.

We are also prepared to furnish special sizes of channels with webs up to 6 in. wide, legs up to 2 1/2 in. in any lengths. The thickness of steel may be from No. 8 gage or .050 to .156 in.



SHARON COLD FORMED CHANNELS

Sharon Perforated Cold Formed Channels

Perforations 4 in. on centers. A very substantial, as well as economical, hollow metal lath partition can be erected with Sharon perforated channels.

Perforations permit the erector to tie metal lath on either side with ease.

Manufactured in the sizes shown in the following table:

Gage No.	Size of web or back, in.	Size of flange or leg, in.	Weight per 1000 lin. ft., lbs.
16	1 1/2	3/4	456
18	1 1/2	3/4	437
18	2	3/4	458
18	2 1/4	3/4	520
18	2 1/2	3/4	542
18	3	3/4	625
18	3 1/4	3/4	708

Stock lengths, 12, 14, 16, 18 and 20 ft.; other lengths can be furnished on special order. Shipped in bundles of convenient size.

SHARON COLD FORMED CHANNELS

SHARON PERFORATED CHANNEL

THE DONLEY BROTHERS COMPANY

Manufacturers of Concrete Inserts

7337 Aetna Road
CLEVELAND, OHIO

Products

The DONLEY INSERT for anchorage in concrete ceilings and walls.

Also manufacturers of Donley Devices for modernizing the home and other Building Specialties of interest to engineers, architects and contractors.

Description

The Donley insert is a malleable iron casting with two diverging roots, capped by flat lugs. Lower part contains cavity. A slot in the exposed under surface communicates with this cavity. One end of this slot is enlarged to admit a bolt head.

Uses

The Donley insert is suitable for the support of shafting, trolley and conveyor tracks, sprinkler system, steam and plumbing pipes, machinery, racks or whatever equipment is to be suspended by bolts.

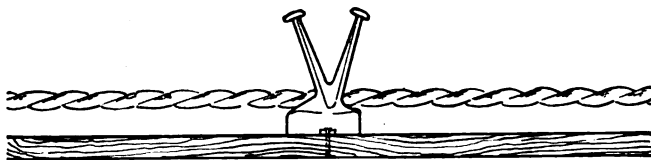


DONLEY INSERT

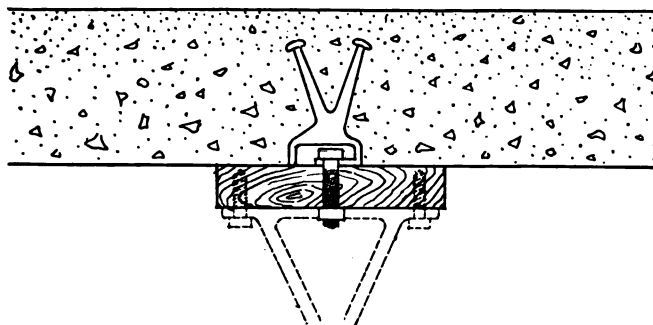
Result of Tests

The superior quality of Donley inserts is the result of an exhaustive series of tests on various types of inserts and experimental models, the inserts being embedded in cubes of concrete and loaded to failure. Three factors of strength were recognized, (1) the strength of the concrete, (2) strength and tenacity of the insert, (3) tensile strength of the bolt.

The Donley insert as finally perfected and shown herewith stood a stress in excess of the ultimate strength of the corresponding size of steel bolt.



SECTION OF CENTERING SHOWING DONLEY INSERT



SECTION OF DONLEY INSERT SHOWING ONE TYPE OF ASSEMBLY

Safety from Collapse

Safe loads noted in the accompanying table represent the bolt strength subjected to a safety factor of 4. Unforeseen future uses of any building argue for the use of an insert whose supporting strength equals the bolt strength, otherwise the future user is deceived by the apparent strength of the insert and collapse is risked. If anticipated loads are light, it is much better to use a Donley insert of small bolt size for sake of economy rather than an inferior insert of large bolt size.

THE DONLEY BROTHERS COMPANY makes no cheaper grade of competitive insert. The name Donley can safely be accepted as our guarantee of the best quality which we have been able to achieve in years of manufacture and research.

Complete in Itself

The Donley insert is complete in itself, contrasting with types of insert which have a hook or ring through which a bar is passed for the better engagement of the concrete. This is an element of economy, but the chief recommendation is that of maximum safety due to ascertained supporting strength.

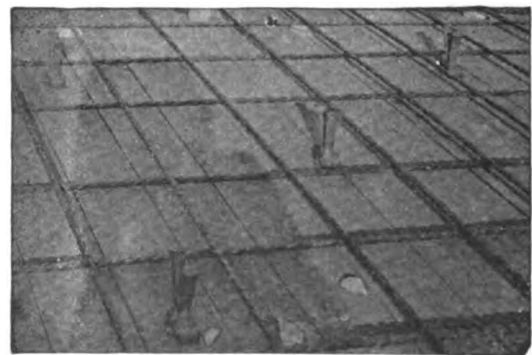
DONLEY INSERTS

No.....	34	58	12	38
Size bolt, in.....	$\frac{3}{4}$	$\frac{5}{8}$	$\frac{1}{2}$	$\frac{3}{8}$
Safe load, lb.....	4900	3300	2300	1200
Height over all, in.....	6	5	4	3
Length, in.....	$2\frac{3}{4}$	$2\frac{5}{8}$	$2\frac{1}{2}$	2
Shipping weight per 100, lbs..	185	135	85	38

Suggested Specifications for Installation

The Donley insert is tacked to the floor form, two notched lugs engaging the nails. The following specification is recommended:

The Donley inserts No. 12 (or size desired) shall be placed in rows spaced 4 ft. on centers—not to exceed 4 ft. apart in rows. Rows to start 1 ft. from wall or from beams which project below ceiling. They shall be placed on the concrete forms with the insert slot at right angles to the lines of shafting or other equipment to be supported, then nailed securely in position.



FLOOR FORMS WITH DONLEY INSERTS IN PLACE

NATIONAL LEAD CO.

Manufacturers of Expansion Bolts and Anchoring Specialties

111 Broadway
NEW YORK, N. Y.

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STEWART & ROMAINE MFG. CO.
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PROVIDENCE, R. I.
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WICHITA, KANS.
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WORCESTER, MASS.
DUNCAN & GOODSELL CO.

Products

CINCH EXPANSION BOLTS.

Also Steel Drills and Calking Tools for installing Cinch Anchoring Specialties.

Superiority of the Cinch Anchoring System

The problem of fastening various fixtures to concrete, cement and other masonry was not wholly solved until the advent of the Cinch system.

Numerous and widely different methods of anchoring have been tried from molten lead down to the rigid shield type of expansion bolt, but none have completely met the stringent and varied demands made upon them.

The principal disadvantage of the ordinary expansion bolt with hard, malleable iron shields was that they made contact only at the high spots, and when the masonry was soft fractures and crumbling resulted, and the bolt loosened due to vibration.

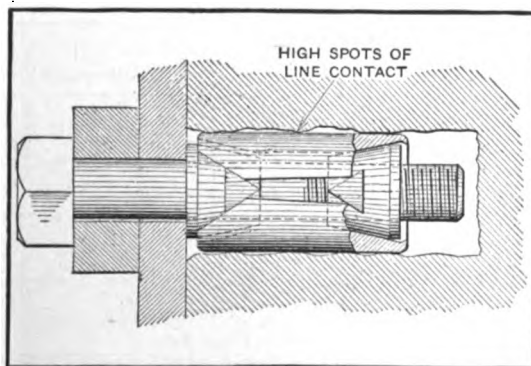


FIG. 1. HARD SHIELD EXPANSION BOLT
Note knife-edge high-spot contact. The hard shield does not expand into contact with the deeper irregularities of the wall of the hole

If the high spots in contact were hard, nothing more than a knife-edge, friction surface was obtained (Fig. 1).

With the Cinch type of expansion, the relatively soft expansion members are forced by compression against the cylindrical surface of the hole, filling up all irregularities in the surface, without fracturing the masonry. After full expansion, the direction of the reactive forces resisting the pull is at 60° with the axis of the bolt in a conical truss, distributing the load or pull throughout the entire cylindrical surface of the hole (Fig. 2), and not at a few points only, as is the case

with other makes of expansion bolts.

The hole being completely and solidly filled by the expanded alloy washers, which can not shrink under restraint, can not squeeze out, vibration in the foundation holding the anchorage will not cause loosening of the anchorage.

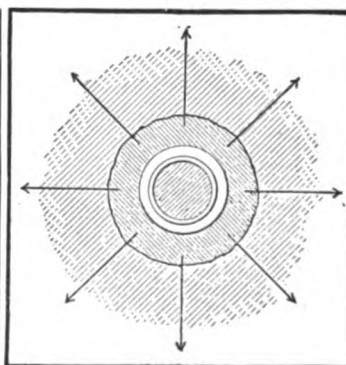


FIG. 2. COMPLETE CYLINDRICAL SURFACE CONTACT OBTAINED WITH THE CINCH TYPE OF EXPANSION

Arrows show how pull of bolt is distributed around periphery of hole

Cinch Anchoring Specialties

Cinch Drive Sleeve Expansion Bolts—No calking tools necessary to install—a few raps with hammer drives shield securely into masonry, providing a secure, permanent anchor which can not vibrate loose nor ride walls of hole. Can be installed with a great saving of time over any other method of anchorage. With shield installed, it is only necessary to place work in position and screw bolt in shield. Note long thread allowing ample take-up in tightening the bolt.

These expansion bolts can be furnished without the drive sleeve (Fig. 4), consisting simply of the extension threaded male cone and its single alloy. The shield



Fig. 3. Single Unit with Drive Sleeve

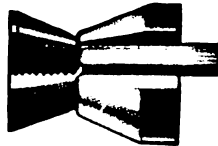
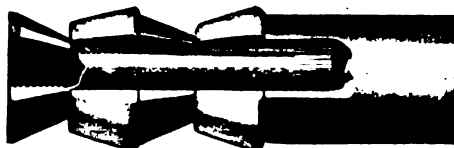


Fig. 4. Single Unit without Drive Sleeve

Fig. 5. Two-unit with Drive Sleeve
CINCH DRIVE SLEEVE EXPANSION BOLTS

is then expanded with an ordinary piece of iron pipe or calking tool. When extraordinary strength of anchorage is required, two-unit bolts should be used (Fig. 5) and installed in same manner as single unit.

Cinch Anchors—A cinch anchorage can be used on any machine bolt or machine threaded attachment device. It consists of two or more lead-and-iron expansion units, as explained below. A two-unit anchorage is sufficient to carry ordinary loads. The smallest cinch anchorage, 3/16 in., has carried a weight of over 1000 lbs. in numerous tests.

Cinch Expansion Unit—One cinch expansion unit is shown in Fig. 6. It consists of two parts: (a) a conical wedge male part, either plain or



Fig. 6. ONE-UNIT PLAIN CINCH ANCHORAGE



Fig. 7. TWO-UNIT PLAIN CINCH ANCHORAGE

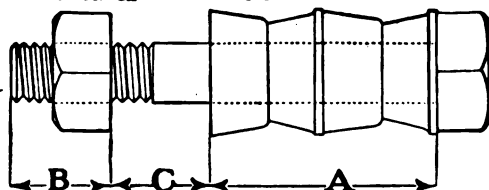
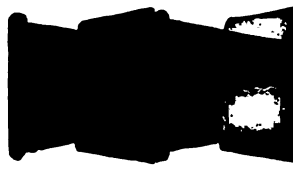
Fig. 8. TWO-UNIT PLAIN ANCHORAGE
A+B+C=length of bolt
A=length of two-unit anchorage
B=length of unit
C=thickness of work

Fig. 12. TWO-UNIT THREADED CINCH ANCHORAGE

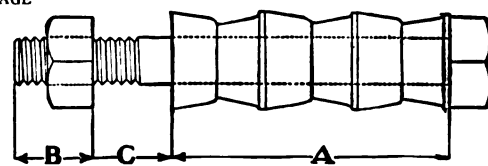
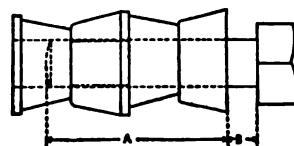
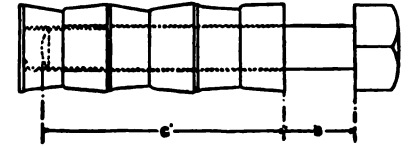
Fig. 14. THREE-UNIT PLAIN ANCHORAGE
A+B+C=length of bolt
A=length of three-unit anchorage
B=length of unit
C=thickness of work

Fig. 9. TWO-UNIT THREADED CINCH ANCHOR

Consists of a two-unit threaded Cinch anchorage (Fig. 12) fitted on a standard machine bolt. Expansion unit on the left is threaded, the other plain, without thread. Order of parts is iron, lead, iron-lead

Fig. 10. TWO-UNIT THREADED ANCHORAGE
Length of bolt=A+B
A=length of two-unit anchorage
B=thickness of workFig. 11. THREE-UNIT THREADED ANCHORAGE
Length of bolt=C+B
C=length of three-unit anchorage
B=thickness of work

*DIMENSIONS OF CINCH EXPANSION BOLTS

Size bolt, in.....	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/4	1 1/2
Length A, in.....	3/8	1	1 1/4	1 3/4	2 1/4	2 3/4	3 1/4	4	5 1/4	6 1/4
Length C, in.....	1 3/8	1 1/2	1 3/4	2 1/4	2 3/4	2 3/4	3 1/4	3 3/4	4 3/4	5 1/4

*DIMENSIONS OF CINCH ANCHORS AND STUD ANCHORS

TWO-UNIT ANCHORAGE										
Size bolt, in..	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/4	1 1/2
Length A, in.	3/8	1	1 1/4	1 3/4	2 1/4	2 3/4	3 1/4	4	5 1/4	6 1/4
Length B, in.	1/4	3/8	1/2	3/4	1	1 1/4	1 3/4	2	2 3/4	3 1/4

THREE-UNIT ANCHORAGE										
Size bolt, in..	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/4	1 1/2
Length A, in.	1 1/4	1 1/2	1 3/4	2 1/4	2 3/4	2 3/4	3 1/4	3 3/4	4 3/4	5 1/4
Length B, in.	1/4	3/8	1/2	3/4	1	1 1/4	1 3/4	2	2 3/4	3 1/4

*For length of bolt required, add thickness of material to length of Cinch expansion units and length of nuts.

Distinctive Features of the Cinch Anchoring System

Cinch anchorages can not pull out or vibrate loose; the greater the load sustained, the stronger the hold obtained. They are guaranteed to hold beyond the tensile and shearing strength of the bolt, as well as the breaking strength of the nut. They require a hole of less depth than any other expansion bolt, affording an enormous saving of labor, time and material. They can be set in masonry, with head of bolt in or out of hole before work is placed in position. Work can be fastened in position later and bolted fast.

A complete cylindrical surface contact with the walls of regular or irregular holes is made by the Cinch anchorage in contrast to the knife-edged and high-spot contact of systems of the hard shell type.

A perfect conical truss is formed by each expansion unit. Bolt and nut act as a strut having its abutment in circular form against the lead alloy part and the periphery of the

hole. Its beam member is, therefore, substantially supported. All parts when in place are under complete restraint, enabling them to carry tremendous loads.

Cinch anchoring specialties eliminate the necessity of placing long foundation bolts with templates in concrete foundations for machines or engines. When templates are definitely located, bolt holes can be cored or drilled and bolts inserted when the machine is in position.

When Cinch anchoring specialties are used with timber, the shrinkage or expansion will not affect the anchorage as it does with malleable iron shields, which collapse.

There is no limit to the strength of the Cinch anchorage as it can be compounded to 2, 3, 4, 5 and more unit anchorages, adapted to reach or overreach the tensile and shearing strength of any steel on the market.



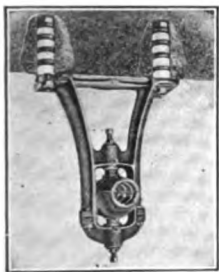
FIG. 15. TWO-UNIT THREADED CINCH EXPANSION BOLT INSTALLED

Note that head of bolt is out of hole. Bolt can be taken out at any time

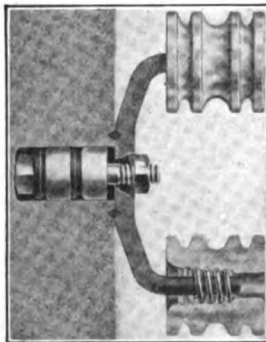


FIG. 16. TWO-UNIT PLAIN CINCH ANCHOR INSTALLED

Note that head of bolt is in hole. Bolt can not be removed



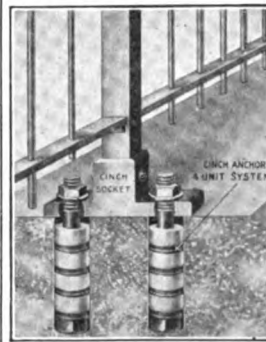
Overhead Hanger Anchored with Four-unit Cinch Anchors



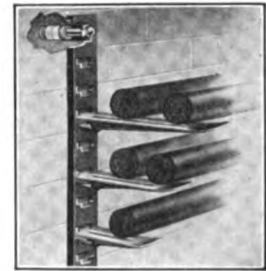
Insulator Spool Anchored with Two-unit Cinch Anchor



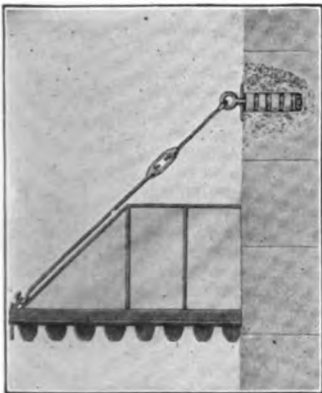
Steel Locker Anchored with Two-unit Cinch Anchors



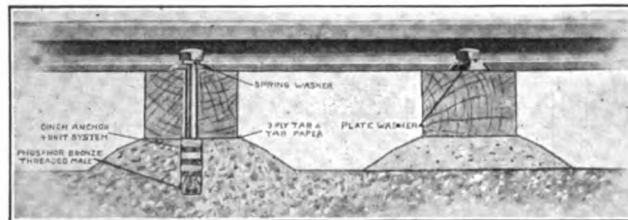
Cinch Fence Socket Used in Combination with Cinch Anchors



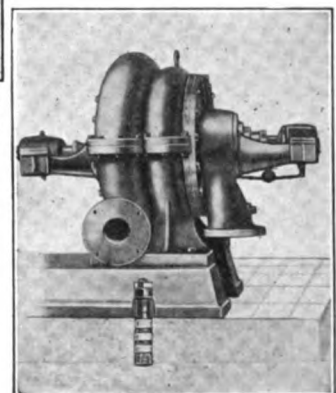
Pipe Brackets Fastened with Two-unit Cinch Anchors



Marquise Anchored with Four-unit Cinch Anchor



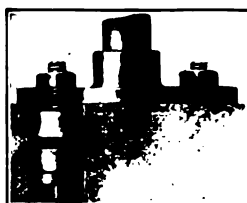
Method of Anchoring Rails to Concrete Road Bed with Four-unit Cinch Anchor



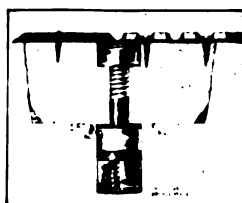
Machinery Anchored with Three-unit Cinch Anchor



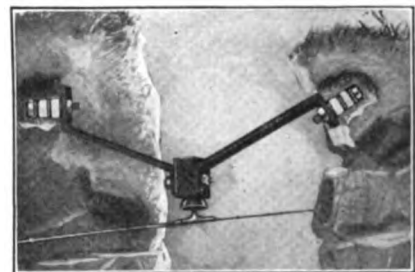
Pipe Lines and Lighting Fixtures Fastened with Two-unit Cinch Anchors in Mining, Tunnel and Shaft Work



Railings of New York Subway Anchored with Cinch Anchors



Safety Stair Tread Fastened with Two-unit Cinch Anchors



Trolley Line Anchored with Two-unit Cinch Anchors

FIG. 17. A FEW USES TO WHICH CINCH ANCHORAGE SPECIALTIES ARE ADAPTED

RICHMOND SCREW ANCHOR CO.

TELEPHONE
BEEKMAN 4000

Pulitzer Building
NEW YORK, N. Y.

CABLE ADDRESS
"JURICH, NEW YORK"
ABC Code, 5th Edition

AGENCIES

PHILADELPHIA, PA., GILES & RANSOME, 1008 Commonwealth Building
BALTIMORE, MD., D. P. MULKAY, 406 Builders Exchange
CHICAGO, ILL., SYMONS CLAMP & MFG. Co., 2112 South Sawyer Avenue
NORFOLK, VA., D. P. PAGE, 64 Commercial Place
BOSTON, MASS., WM. C. PICKERSGILL, 18 Tremont Street

PROVIDENCE, R. I., ALBERT C. CROSS, 530 Grosvenor Building
ALBANY, N. Y., C. W. HAEFNER, 68 State Street
KANSAS CITY, MO., SYMONS CLAMP & MFG. Co., 615 Reliance Building
SAN FRANCISCO, CAL., A. W. RANSOME, 750 Monadnock Building
PARIS, FRANCE, JEAN THIOILLIER, 92 Boulevard Haussmann

Products

RICHMOND SCREW ANCHORS for fastening all styles of screws into masonry or composition materials; "TYSCRU" FORM TIES.

Also manufacturers of Expansion, Anchor, Form and Centering Bolts; Wall Plugs; Expansion Shields; Concrete Pole Steps, and Concrete Inserts.

Richmond Screw Anchors

These anchors are made in two types, and can be set before concrete is poured, by affixing to forms; or, later on, by drilling a hole into masonry and setting screw anchor and screw together into it, in portland cement.



SCREW AND DOUBLE COIL
ANCHOR
For use in plaster



BOLT AND FLAT COIL
ANCHOR
For use in concrete

Strength—Made of steel, a minimum of metal provides a maximum of strength; all stresses are transmitted to surrounding masonry. Tests show that bolt breaks before anchor loosens. Placed in concrete it becomes integral with the work, and can not vibrate or loosen without destruction of entire surrounding medium.

Government tests indicate freedom from adhesion for bolts, even in largest sizes, after a lapse of 28 days. Non-adhesion is guaranteed.



RICHMOND SCREW ANCHOR, SHOWING
ITS STRENGTH

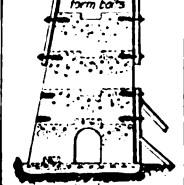
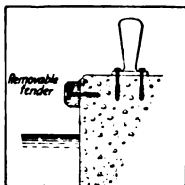
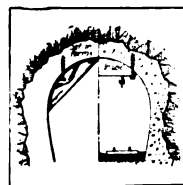
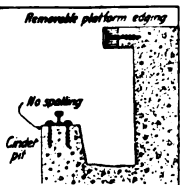
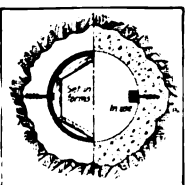
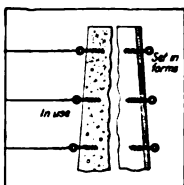
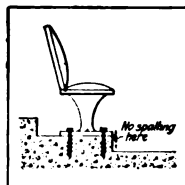
PRICE LIST PER 100 (SUBJECT TO DISCOUNT)
SQUARE HEAD BOLTS AND FLAT COIL STEEL ANCHORS

Length under head, in.	Diameter of bolt in inches							
	1/4 and 3/8	1/2	3/4	7/8	1	1 1/4	1 1/2	1 3/4
4	\$ 9.00	\$12.60	\$17.00	\$24.30				
5	9.50	13.30	18.00	25.70	\$36.00	\$47.90		
6	10.00	14.00	19.00	27.10	38.00	50.50		
8		15.40	21.00	29.90	42.00	55.70		
10		16.80	23.00	32.70	46.00	60.90		
12		18.20	25.00	35.50	50.00	66.10	\$160.00	\$225.00
18							180.00	275.00

FLAT COIL ANCHORS ONLY

\$ 6.00 \$ 8.00 \$12.00 \$16.00 \$21.00 \$26.00 \$60.00 \$100.00

Bolts of other lengths at proportionate prices.



TYPICAL USES OF RICHMOND SCREW ANCHORS

Grandstands: Yale Bowl; University of Chicago; University of Michigan; McGill University, etc.

Posts and poles: Removable screws permit stripping vertical forms. N. Y. Barge Canal, Catskill Aqueduct

Mine shafts: Removable screws permit stripping vertical forms: cage guides. Catskill Aqueduct, Vulcan Iron Mines

Railroads: Rails to concrete ties; platform edgings, etc. N. Y., N. H. & H. R.R., B. R. T. R.R., D. L. & W. R.R., etc.

Tunnels: Removable screws permit stripping forms. Overhead transmission. C. P. R. in Mt. Royal tunnel

Docks: Used by N. Y. State Barge Canal, U. S. Army and Navy engineers, Montreal, Philadelphia, New York, Baltimore

Cantilever forms: Walls and dams. The anchor only remains in the work; light to handle, easy to set

PRICE LIST PER 100 (SUBJECT TO DISCOUNT) FLAT HEAD IRON WOOD SCREWS AND DOUBLE COIL GALVANIZED STEEL ANCHORS

Length over all, in.	Trade No. and diameter of screw in decimals of an inch					
	No. 8 .1631	No. 12 .2158	No. 16 .2684	No. 20 .3210	No. 24 .3737	No. 30 .4526
2	\$3.70	\$4.75	\$5.55			
3	4.40	5.40	6.20	\$8.30	\$10.10	
4		6.25	7.00	9.35	11.40	\$17.00
5			7.95	10.60	12.95	19.00
6			9.10	11.95	14.70	21.00

DOUBLE COIL ANCHORS ONLY

\$3.00 \$4.00 \$5.00 \$6.50 \$8.00 \$11.00

Screws of other lengths at proportionate prices.

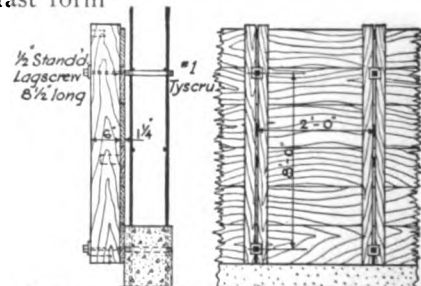
Form Tie—"Tyscru" (Patented August 28, 1917)

"Tyscru" is good for a working load of 5000 lbs.



"Tyscru" is a fast form tie, saving more than half the time of any other method. "Tyscru" costs less than annealed wire alone required for any operation, and is four times as fast.

"Tyscru" is tie, spreader, and gauge up to 18 in. "Tyscru" costs less than rods, clamps and spreaders because it is more than twice as fast. "Tyscru" gives a handy attachment for reinforcing rods holding them firm and true. "Tyscru" affords a convenient anchorage for succeeding set-ups in wall construction.



DETAILS OF "Tyscru" CONSTRUCTION

Price List		Spacing		
Length, in.	Per 100	Height of wet unset concrete, ft.	Spacing of Tyscrus vertically, ft.	Spacing of Tyscrus horizontally, ft.
4	\$19.50	2-0	6-0	18-0
6	20.50	3-0	5-0	12-0
8	22.00	4-0	4-0	6-0
10	23.50	5-0	4-0	4-0
12	25.50	6-0	4-0	3-6
14	28.00	7-0	4-0	3-0
16	29.50	8-0	4-0	2-0
18	31.00	9-0	2-0	2-6
20	32.00	10-0	2-0	2-3
22	33.00			
24	34.00			
26	35.50			
28	37.00			
30	38.50			

Longer lengths on application.

"Tyscru" leaves in the walls anchorages at frequent intervals for work benches, shelving, shafting, steam pipes, starting boxes, etc.

AMERICAN ENAMELED BRICK & TILE CO.

INCORPORATED 1893

Manufacturers of Fire and Enameled Brick; Dealers in Face Brick

TELEPHONES

MURRAY HILL 8787, 8788

52 Vanderbilt Avenue

NEW YORK, N. Y.

CABLE ADDRESS

"AMEREBRICK"

Products

ENAMELED BRICK, White, Mottled and Standard Colors, in standard sizes and ornamental shapes.

Also manufacturers of Fire Brick, Standard 9-in. and 9-in. Series Shapes (as adopted by the members of the Refractories Manufacturers' Association), and Special Shapes.

Fire Clay, packed in bags or in bulk.

Dealers in Face Brick, all shades and textures.

Territory

The business operations of this firm cover North and South America, Europe, Asia and Australia.

Personal Representatives

For the convenience of our customers in the United States and Canada, we have, in order to keep in closer touch with them, located representatives in all the principal cities to attend personally to inquiries, orders and deliveries.

Facilities

We are the largest manufacturers of enameled brick in North and South America.

Our works, located but an hour's travel from the New York office, are situated so as to enable shipping over two of the largest railroads, viz., the Pennsylvania and the Central of New Jersey, and their connecting lines.

Capacity

Our present capacity is 12,000,000 brick per annum, which will be increased as occasioned by the demand.

Stock

The average stock on hand at our factory is more than 2,000,000 brick, giving a large assortment for immediate delivery.

Illustrations of Stock Designs of Enameled Brick

Much delay is saved by use of stock designs of moulded brick.

In the following pages are shown designs that we recommend as being most satisfactory in manufacturing results.

We try to keep a stock of these on hand, in standard colors.

These designs are chosen to reduce manufacturing difficulties and delays to a minimum; to enable composite mouldings to be made up; and to enable prompt filling of orders.

Colors—Bright, Medium or Matt Finish

In addition to our regular white and standard colors, such as our sage green, red brown, etc., we have made a specialty of mottles in the following colors:

Gray, brown, black, blue and blue-brown in both enameled and porcelain finish, which give a very fine appearance for both interior and exterior work, having a finish more on the type of marble than enameled or porcelain brick.

If you have in mind, at any time, a particular color, shade or finish of enameled brick for interior or exterior purposes, advise us of your ideas and requirements and we will be pleased to submit samples.

Uniformity of Shade of Enameled Brick

We guarantee uniformity of shade in all first quality deliveries to the limit of practicability. Colors and effects giving most uniform results are, in order of degree of uniformity, white, mottled gray, mottled brown, mottled black, sage green and red brown. Other colors follow in irregular positions.

We will try on orders of moderate size, or on larger orders, if ample time be given, to match in shade the moulded and stretcher stock, but can not always guarantee to uniformly shade shipments of specials, particularly on rush shipments.

Special Features and Advantages of Our Enameled and Porcelain Brick

In making our product we follow the English and Scotch systems, working by the soft mud process. This is without question the only process which insures durability and the closest relation of bond obtainable between body and glaze.

Our brick are burnt in but one fire, thus making the chemical change in the body and the glaze simultaneous.

Where manufacturers use the dry pressed process, the brick have to be burnt first as front brick before the enamel can be applied, and fired again for the fluxing of the glaze.

Where the enamel is applied on an already burnt brick and fluxed in a second fire, the bond is weak and peeling is sure to follow.

We use hard and durable glazes; not soft lead glazes frequently seen on inferior grades of enameled brick and tile.

There has not been a single case during our twenty-eight years of business where any peeling or discoloring has been seen or reported.

This is better than any guarantee which we might be asked to give, as it covers a distributed output of over 125,000,000 brick, located all over the United States, Canada, South America and elsewhere, subject to all varieties of climatic conditions.

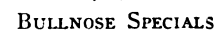
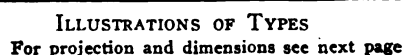
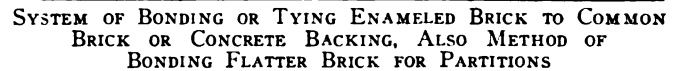
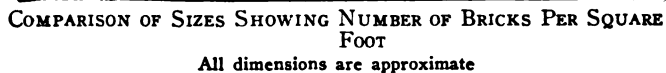
Cleaning

Enameled brick are best cleaned with some alkaline solution, such as caustic soda or sodium carbonate. This cleans the enamel and does not affect the cement or lime mortar.

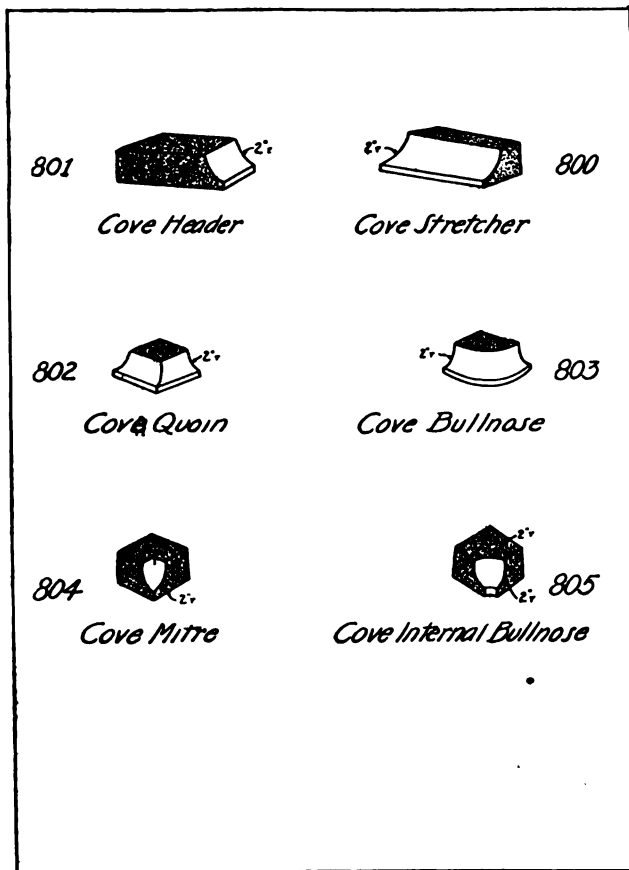
Acids

Sulphuric, nitric or hydrochloric acids, even in concentrated form, will not affect our glazes; but if used as a wash, even when diluted, they will attack the cement or lime mortar.

The only commercial acids which will attack and destroy our enamel are hydrofluoric and hydrofluosilicic.

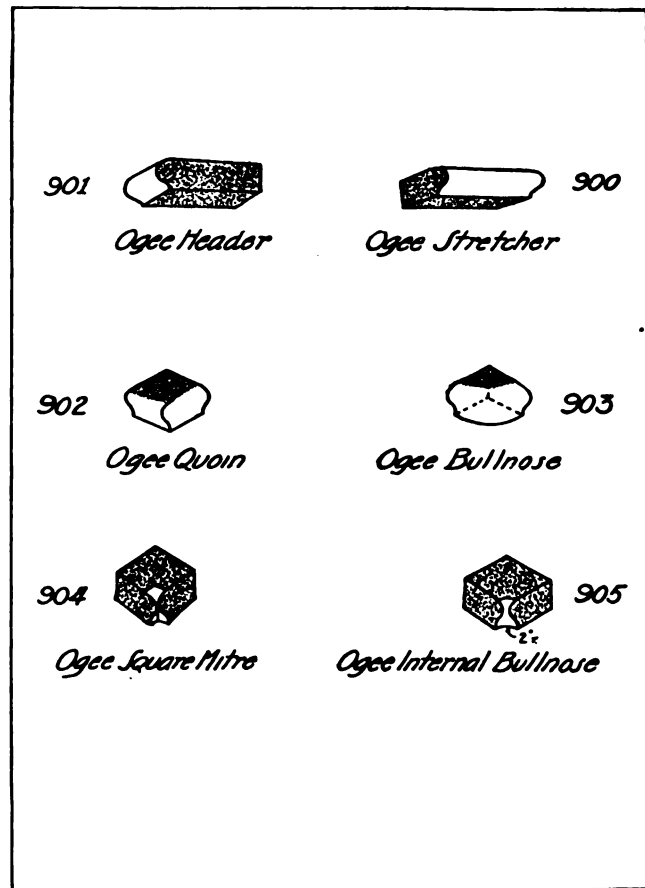


For projection and dimensions see next page. All brick shown have 2-in. radius



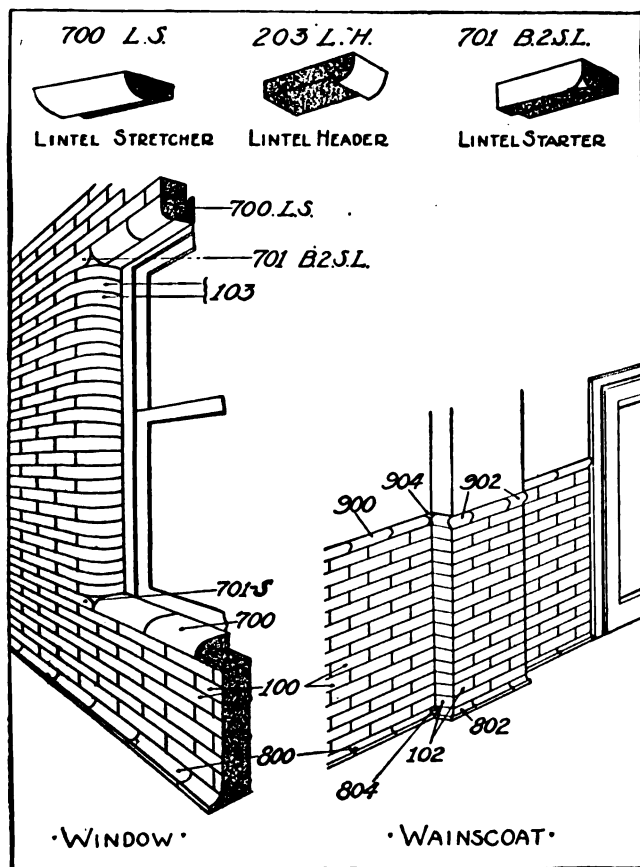
COVE MOULD

For projection and dimensions see cut below

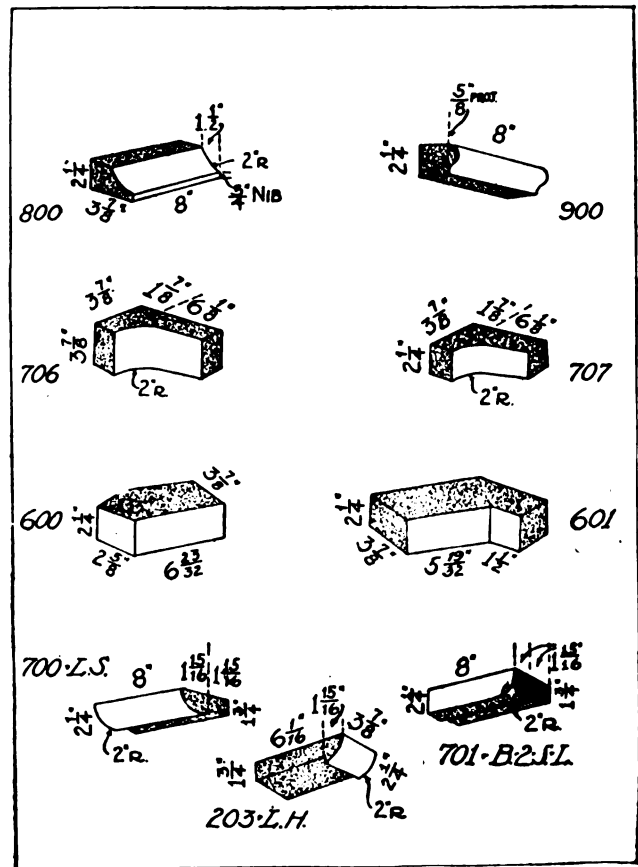


OEGEE MOULD

For projection and dimensions see cut below



STUDY OF A WINDOW OPENING AND OF A BASE AND CAP COURSE
For projection and dimensions see next cut



PROJECTION AND DIMENSIONS OF SPECIAL SHAPES

KUSHEQUA BRICK COMPANY

Manufacturers of Face Brick and Packing Materials

OXBLOOD AND GARNET PLANTS

KUSHEQUA, PA.

Products

FACE BRICK; VENEER BRICKETTES; PACKING HOUSE FLOOR BRICK; PAVING BRICK; ACID TOWER PACKING.

Kushequa Face Brick

The characteristics of Kushequa face bricks are their deep color (specially dark red), great strength and high vitrification. Kushequa face bricks include Kq Paver, Wire-cut, Oxblood and Garnet Devonshire, Velours, Saruk, Autumn oak and Veneer Brickette.

Kq Paver— $2\frac{1}{4} \times 8\frac{1}{4} \times 3\frac{7}{8}$ in.; weight, 6 $\frac{1}{8}$ lbs. Re-pressed, with bevel edges resembles a small paving block. It is particularly pleasing in large buildings.

Wire-cut— $2\frac{1}{2} \times 8 \times 3\frac{3}{4}$ in.; weight, 6 lbs. A standard red brick with smooth face and wire-cut sides, in 4 shades. Shade 1, dark red; Shade 2, deep red; Shade 3, bright red; Shade 4, light red.

Galax— $2\frac{1}{4} \times 8 \times 3\frac{3}{4}$ in.; weight, 6 lbs. Smooth faced, dark red, apparently blended with green. Suggestive of Galax leaf.

Oxblood Devonshire— $2\frac{1}{4} \times 8 \times 3\frac{3}{4}$ in.; weight, 5 $\frac{3}{4}$ lbs. Very rough texture and of clear, uniform red color. Shade 1, the darkest clear red on the market; Shade 2, a fine deep red; Shade 3, a bright red.

Saruk— $2\frac{1}{4} \times 8 \times 3\frac{7}{8}$ in.; weight, 5 $\frac{3}{4}$ lbs. The rough texture and variegated color give this brick an Oriental rug effect. The hues harmoniously blend from deep red through old rose to greenish gray, and from bronze to tan. To get the best effect, it should be laid with dark mortar joints, not exceeding $\frac{1}{2}$ in., raked.

Velour Devonshire and Velour Saruk—Have velvety, finer texture, but similar colors to our other Devonshire and Saruk.

Autumn oak— $2\frac{1}{4} \times 8 \times 3\frac{7}{8}$ in.; weight, 5 $\frac{3}{4}$ lbs. A rough texture brick from our Garnet Plant with full range of colors, warm browns and purplish maroons predominating.



WESTMINSTER PRESBYTERIAN CHURCH, ROCHESTER, N. Y.
Faced with 100,000 Saruk and Oxblood mixed

Moss Garnet—Same as Autumn oak but coarser texture with mossy scum on lighter shades.

Veneer Brickette— $2\frac{1}{4} \times 8 \times 2$ in.; weight, 3 $\frac{1}{2}$ lbs. Texture and coloring same as Autumn oak. Corner ells to match show $2\frac{1}{4} \times 3\frac{3}{4}$ -in. heads. Used for siding on adobe, hollow tile or wooden structures, it gives appearance of solid brick wall. Reduces initial cost of freight, bricklayers' labor and fire risk; saves painting and lessens fuel bills.

Paving and Acidproof Material

This company commenced business in 1904 with the manufacture of paving blocks out of a strongly ferruginous mountain shale highly vitrified by natural gas. The beauty of color and finish of the product created such demand for building purposes that, for several years, the capacity of the factory was principally taken for face bricks. The high vitrification of our products makes them acidproof and electric insulating. Such products comprise:

Kushequa Repressed Paving Block— $3\frac{1}{2} \times 8\frac{3}{4} \times 4$ in.; weight, 10 lbs. Tough, durable, impervious and handsome in finish. Guaranteed to lay 40 per sq. yd., street measure.



HOTEL SHERMAN, CHICAGO, ILL.
HOLABIRD & ROCHE, Architects
Faced with 500,000 Kq Pavers

Brickette— $2\frac{1}{4} \times 8 \times 2$ in.; weight, $3\frac{1}{2}$ lbs. A dark red, thoroughly vitrified brick, useful for floors where hard wear is desired but unnecessary depth is objectionable. It is beautiful for porch floors and hallways. The Mall or concourse at Staten Island end of New York's Municipal Ferry is paved with Kushequa Brickettes. Much used for packing house floors.

Packing House Floor Brick— $4 \times 8 \times 1\frac{3}{4}$ in.; weight, $4\frac{3}{4}$ lbs. Specially made for packing house floors to resist grease, hot water and heavy trucking. One side and two edges smooth, without glaze or kiln-marks; wire-cut ends. Durability and lightness are combined.

Acidtower Packing—Garnet Plant makes vitrified acidproof specialties, notably rings for packing condensery towers at acid works, oil refineries and fertilizer plants. These are hollow cylinders 3 or 6 in. in diameter and same length divided by radial partitions. Other shapes made to order.

Acidproof Specialties

We manufacture special forms of vitrified shale products to order. Battery room floor tile, dye vat linings, Hood's spiral rings and chemical arches are instances.

Shipping Facilities

Daily output, Oxblood Plant, 25,000, Garnet Plant, 20,000 bricks. Ample stocks carried. Both plants are located at Kushequa on the Mt. Jewett, Kinzua & Riterville R. R., a local railroad connecting direct with the Buffalo, Rochester & Pittsburgh Ry., Erie R. R., Pennsylvania R. R., Baltimore & Ohio R. R. and Pittsburgh, Shawmut & Northern R. R., consequently competition in freight rates, prompt car supply, and a minimum of embargo annoyances.

References

The following is a partial list of buildings in which Kushequa products were used, giving the location, architect, kind and quantity:

FACE BRICK

Thorp School, Lockwood and Berteau Streets, Chicago, Ill., A. F. Hussander; Brown Saruk, 60,000.

FACE BRICK—(Continued)

Sanitary District Pump Station, Mohawk and Menominee Streets, Chicago, Ill., F. J. Barrett; Oxblood Devonshire, 40,000.
Collins Apartments, 54th and Cornell Streets, Chicago, Ill., H. L. Newhouse; Kq Paver dark, 60,000.
G. S. Bridge Residence, Evanston, Ill., Geo. W. Maher; Velours Shade 2, 30,000.
Hotel Sherman, Clark and Randolph Streets, Chicago, Ill., Holabird & Roche; Kq Paver dark, 700,000.
Stock Yards Inn, Chicago, Ill., R. L. Lindstrom; Oxblood Devonshire Shade 1, 450,000.
Highlands Co., 6811 Euclid Avenue, Chicago, Ill., J. R. Stone; Kq Paver dark, 25,000.
Callahan Apartments, 1622-24 Garfield Boulevard, Chicago, Ill., Worthmann & Steinbach; Kq Paver light, 35,000.
Y. W. C. A., Brooklyn, N. Y., Frank Freeman; Saruk and Oxblood (Gardens), 180,000.
Erie R. R. Station, Ridgewood, N. J., Graham King; Saruk, 40,000.
Electric Power Plant, South Framingham, Mass.; Kq Paver (2nds), 90,000.
Fire and Truck House No. 8, Germantown Avenue and Bringhurst Street, Philadelphia, Pa., W. B. Powell; 50,000 Wire-cut Shade 3; 52,000 Blackheaders.
8th District Police Station, 10th and Buttonwood Streets, Philadelphia, Pa., W. B. Powell; 47,000 Wire-cut Shade 3; 43,000 Blackheaders.
Church of Our Lady of Rosary, Yonkers, N. Y., John V. Van Pelt; Saruks.
Boys' High School, Louisville, Ky., J. E. Henry; Oxblood and Saruk mixed, 225,000.
Louis Seelbach, Residence, Louisville, Ky., McDonald & Dodd; Wire-cut Shade 2, 65,000.
Westminster Presbyterian Church, Rochester, N. Y.; Saruk and Oxblood Devonshire mixed, 100,000.
Colonial Theater, Dayton, Ohio; Oxblood Devonshire Shade 1, 27,000.
Eagles' Temple, Jamestown, N. Y., Freeburg & Fidler; Saruk.
United Evangelical Church, Oil City, Pa., J. C. Brenot; Saruk, 90,000.
Mayo Bros. Clinic Hospital, Rochester, Minn.; Kq Paver, 125,000.
Mayer Bros.' Block, Erie, Pa., Richard Irvin; Velours, 250,000.
Academy High School, Erie, Pa., Wm. B. Ittner, St. Louis, Mo.; Saruk, 250,000.

PAVING MATERIALS

D. B. Martin Co., Packing House, Claremont, Baltimore, Md.; Brickette, 57,000.
J. J. Felin Packing House, Philadelphia, Pa., C. B. Comstock; Floor Brick, 140,000.
C. K. G. Billings, Driveways, Riverside Drive, New York, N. Y.; Kq Paver (Spl.).
W. M. Rice Institute, Courts and Cloisters, Houston, Tex., Cram, Goodhue & Ferguson; Kq Paver, 25,000.
Hammond Packing Co., Packing House, East Liberty, Pittsburgh, Pa.; Floor Brick.
Kingman & Co., Packing House Floor, Richmond, Va.; Brickettes.



LOUIS SEELBACH RESIDENCE, LOUISVILLE, KY.
McDONALD & DODD, Architects, Louisville, Ky.
Faced with 80,000 Wire-cut Shade 2



V. M. C. A. BUILDING, LOUISVILLE, KY.
McDONALD & DODD, Architects, Louisville, Ky.
Faced with Saruk and Oxblood Devonshire mixed

THE ASSOCIATED TILE MANUFACTURERS

Wall and Floor Tiles, Ceramic Mosaic, Faience

BEAVER FALLS, PA.

MEMBER FACTORIES

ALHAMBRA TILE CO.

Newport, Ky.

AMERICAN ENCAUSTIC TILING CO., LTD.

Zanesville, Ohio

BEAVER FALLS ART TILE CO.

Beaver Falls, Pa.

CAMBRIDGE TILE MFG. CO.

Covington, Ky.

GRUEBY FAIENCE & TILE CO.

Perth Amboy, N. J.

MATAWAN TILE CO.

Matawan, N. J.

MOSAIC TILE CO.

Zanesville, Ohio

NATIONAL TILE CO.

Anderson, Ind.

WHEELING TILE CO. Wheeling, W. Va.

OLD BRIDGE ENAMELED BRICK & TILE CO.

Old Bridge, N. J.

PERTH AMBOY TILE WORKS

Perth Amboy, N. J.

THE C. PARDEE WORKS

Perth Amboy, N. J.

U. S. ENCAUSTIC TILE WORKS

Indianapolis, Ind.

Products

VITREOUS, SEMIVITREOUS, CERAMIC MOSAIC, GLAZED, ENAMELED, FAIENCE and TRIM TILE of every kind and for every purpose; UNGLAZED or BRIGHT, SEMIMATT and DULL GLAZED in all colors; PLAIN or DECORATIVE.

Advantages

Non-porous; non-absorbent; proof against acid and alkaline reaction; serviceable for low or high temperature conditions; oilproof; easily cleansed; sanitary; attractive; permanent; light-reflecting glazes and colors.

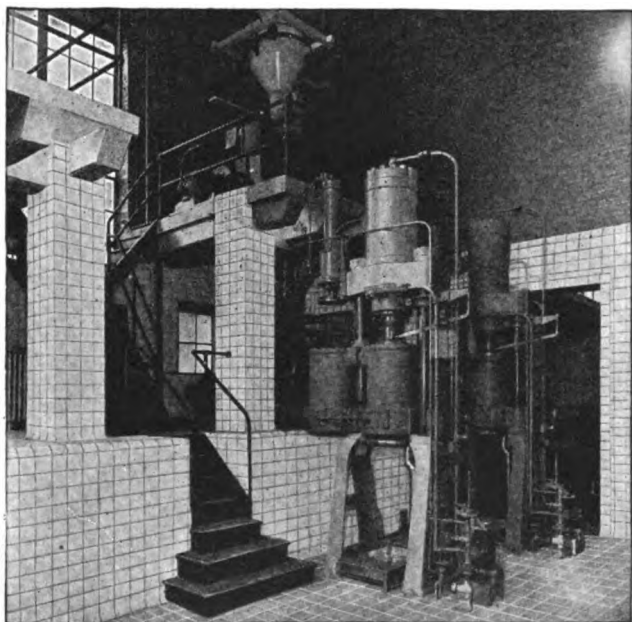
By the use of the proper tiles in workrooms of factories the efficacy of lighting can be increased con-

Uses

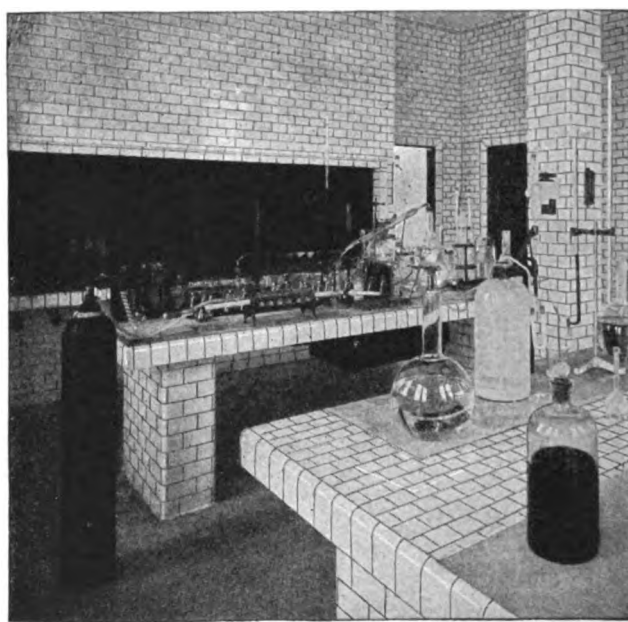
Suitable for the lining of chemical hoods, mixing and acid tanks, vats, agitators, reservoirs and similar containers requiring a non-porous, impermeable and easily cleaned lining material. Recommended for floors, walls, wainscots, ceilings, columns; in laboratories; workrooms; engine rooms; stairways; ramps; first-aid stations; sick wards; toilets; wash-up rooms; showers; swimming pools; cafeterias; dining rooms, etc.

Co-operative Service

On request, our Service Department will make a special study of requirements and conditions where necessary to submit proper recommendations, co-operate in selecting and specifying tiles best suited for any



A TILED MANUFACTURING PLANT



A TILED LABORATORY

siderably and maintained at a minimum cost for cleaning. Neither the color nor the brightness of the glazes deteriorates with age, or is affected by fumes or atmospheric corrosives.

Our tiles are extensively and successfully used for floors, walls and ceilings in dairies, creameries, food factories, laundries, bottling and refrigerating plants, packing houses and factory buildings of almost every kind where cleanliness, permanence and economy in maintenance are wanted.

given purpose, and suggest special setting methods and means for special work. Information on the best practice and assistance in the solution of any problem involving tile work can always be obtained through this department.

Information on acid resisting cements used in connection with our tiles furnished on application. Samples of tiles for tests cheerfully sent on request. Please state intended use and conditions so that correct tiles can be sent at once. Correspondence invited.

THE HOCKING VALLEY FIRE CLAY CO.

Manufacturers of Salt Glazed Brick

NELSONVILLE, OHIO

SALES AGENCIES IN ALL PRINCIPAL CITIES OF UNITED STATES AND CANADA

Products

ATHENA SALT GLAZED BRICK.
SANITARY FLOOR BRICK.
EVERWEAR PAVING TILE.

Athena Salt Glazed Brick

Size— $8 \times 2\frac{1}{4} \times 3\frac{3}{8}$ in.

Shade Numbers, etc.—Made in beautiful shades of mahogany (105), brown (106), golden (107), buff (108), thoroughly vitrified and salt glazed on both faces and ends, and rich in both color and glaze. All standard shapes carried in stock and special shapes made on order.

Interior Uses—For facing entire interior walls or wainscot work wherever sanitary conditions are desired. Principal places: schools, hospitals, gymnasiums, swimming pools, stables, garages; office, factory and warehouse buildings; prisons, power plants, city market houses, acid rooms and vats, fire engine houses, packing plants; subways, passenger and freight depots.

Few Important Jobs (Interior)—

World's Largest Electric Generating Station, United Electric Light & Power Co., 201st Street, New York City (see illustration)

Lincoln Park Lion House, Chicago, Ill.

Roseland & Mayfair Pumping Stations, Chicago, Ill.

Twin Market Houses, Pittsburgh, Pa.

Fire Engine Houses, Chicago, New York and Boston

General Chemical Co. Plants (many parts of United States)

Swift & Armour Packing Plants (various places)

Pennsylvania Railroad Stations and Tunnels

Ohio Penitentiary, Columbus, Ohio

Both High and Grade Schools in all principal cities of United States and Canada

Exterior Uses—For facing all exterior walls where a beautiful sanitary and permanent wall is desired, as it is not affected by acids or the elements.

Few Important Jobs (Exterior)—

6-story Moose Building in Loop District, Chicago, Ill.

Apartment Buildings in all principal cities

3-story Business Block, Dr. J. E. Pickett, Minersville, Pa.

3-story Business Block, Marvin DeMaine, Pomeroy, Ohio

These brick have been furnished for exterior facing in almost every conceivable class of building.

Sanitary Floor Brick

Size—Size $8\frac{1}{4} \times 4 \times 1\frac{3}{8}$ in.

Uses—This product is usually embedded in cement and adapted to practically the same class of floors as those named for our Everwear paving tile, but where the desire is for lighter weight material. Especially desirable in packing house floors, and is being used extensively for such purposes. Only one side is glazed and either side can be turned up as desired.

Few Special Jobs—

Cincinnati Abattoir Co., Cincinnati, Ohio

Detroit Edison Co., Detroit, Mich.

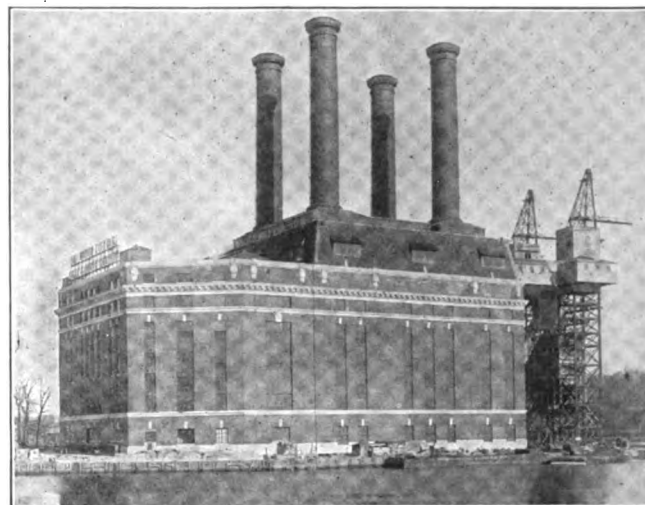
Wm. Davies, Ltd. (Packing Plant), Toronto, Ont.

Swift & Co., Chicago, Ill.

Armour & Co., Chicago, Ill.

Everwear Paving Tile

Size—Size $10 \times 5 \times 2\frac{1}{4}$ in.



201ST STREET GENERATING STATION, UNITED ELECTRIC LIGHT & POWER CO., NEW YORK, N. Y.

W. E. McCoy, Engineer F. F. Nesbit & Co., Contractors
650,000 brick used, shades 103 and 102 (interior)

Uses—Extensively used for paving floors of engine and boiler rooms, power and industrial plants; basements of public buildings, schools, warehouses and battery rooms; paving around electric and steam railway passenger and freight depots. Thoroughly vitrified and only one side glazed, and unsurpassed for beauty and wearing qualities. They save 50% over cement floors on original cost, and have many times the life of a cement floor.

These tile have been upon the floors of boiler and engine rooms of the New York Life Insurance Building, New York, for 20 years and show scarcely any wear.

Few of Many Concerns Using Same—

Chicago Edison Electric Co., Chicago, Ill.

Cleveland Electric Railway Co., Cleveland, Ohio

Cincinnati Gas & Electric Co., Cincinnati, Ohio

Ford Motor Co., Detroit, Mich.

Aluminum Castings Co., Detroit, Mich.

Hocking Valley Railway Co., Columbus, Ohio

General Qualities of Salt Glazed Material

All shades of the standard brick and two classes of floor brick are burned to about 2200° Fahr.; it is thoroughly vitrified and salt glazed; non-absorbent of moisture; absolutely acidproof; will not craze, crack or peel; withstands all the elements of the air besides heavy crushing strain, and always looks fresh and clean.

Samples

Communicate with this company and the nearest sales agency will be directed to submit samples and prices at once.

Facilities

With a daily capacity of 50,000 brick, or approximately 15,000,000 annually, and a large and well selected stock for quick shipment, all business is given prompt attention.

NATIONAL FIRE PROOFING COMPANY

ORGANIZED 1889

Manufacturers of Natco Hollow Tile

MAIN OFFICE
Fulton Building
PITTSBURGH, PA.

BRANCH OFFICES IN PRINCIPAL CITIES

Twenty-one factories in the United States and one at Hamilton, Ont.

Products and Services

Manufacturers of DENSE and POROUS HOLLOW TILE for Fireproof Floors, Roofs, Ceilings, Partitions, Wall Furring, Column and Girder Coverings, and for Exterior Walls of all kinds, including barns, silos, and other farm buildings; NATCO LOCK JOINT SEWER TILE and NATCO FACE TILE in various types.

Trade-mark

Look for the trade-mark "Natco" indelibly stamped on every piece of our product; it is protection against substitution.

Natco Advantages

Natco hollow tile construction is superior in its moistureproofing, soundproofing, heat preserving (and conversely heat resisting), sanitary qualities, and from the standpoint of economy both initial and final.

Natco Floor Construction

Floor arches of hollow tile can be set in winter, as the construction dries out in a few days. They are more nearly soundproof than solid construction. Following are illustrations and descriptions of some of the forms in common use. Only typical sections are given. Write for bulletin No. 171, "Natco Standard Fireproofing."

Natco Flat Arches

The flat arch is the accepted type of standard fireproof floor construction, meeting every requirement as to strength, fire protection, architectural appearance and minimum weight.

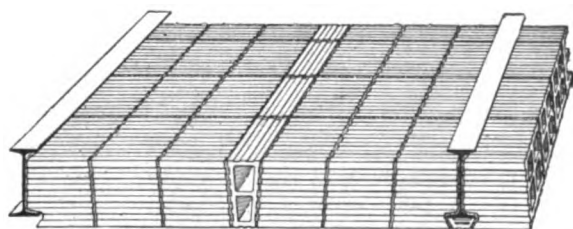


FIG. 1. PERSPECTIVE OF STANDARD NATCO FLAT ARCH

APPROXIMATE WEIGHTS AND SAFE SPANS NATCO FLAT ARCHES
(For designing purposes only)

Depth of arch, in.	Weight, lbs. per sq. ft.	Spans allowable between I-beams, arch set flat, ft. in.		Depth of arch, in.	Weight, lbs. per sq. ft.	Spans allowable between I-beams, arch set flat, ft. in.	
6	26	4	0	11	41	7	0
7	30	4	6	12	44	8	0
8	32	5	0	14	50	9	0
9	36	6	0	15	54	9	6
10	38	6	6	16	55	10	0

The strength of any arch depends as largely on workmanship as on materials, therefore the maximum spans given can be used only where experienced workmen are employed and work is guaranteed by a responsible contractor.

The Natco hollow tile flat arch construction, as illustrated above, has been developed as this company's standard for this type.

"Combination" System of Long Span Floor Slab

Used without girders for clear spans up to 25 ft. Rows of tile 12 in. wide between reinforced concrete

joists 4 to 6 in. wide, monolithic with a concrete top coat 2 in. thick, mixed 1 part cement, 2 parts sand, and 4 parts gravel. Eliminates beam forms and requires one-third to one-half less flat centering, effecting great economy in erection.

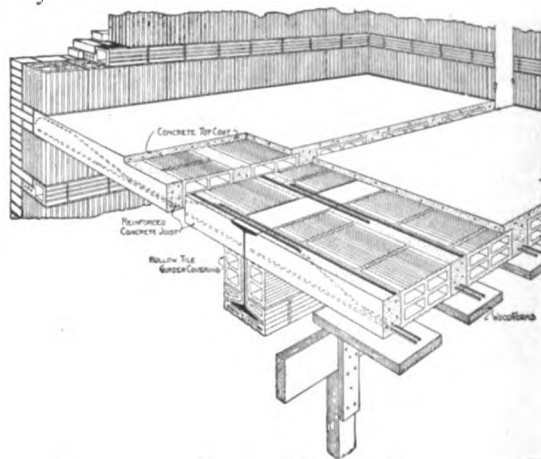


FIG. 2. PERSPECTIVE VIEW OF TYPICAL COMBINATION FLOOR

Note economical wood centering used; 2x8 in. or 2x10 in. under each joist is sufficient

"Natcofloor" System of Fireproof Construction

An exceptionally light slab of wonderful strength designed to reduce the dead load of fireproof floor construction carried on girders, columns, and footings. A minimum of flat centering required and an all-tile ceiling surface dovetail-scored for plastering a feature.

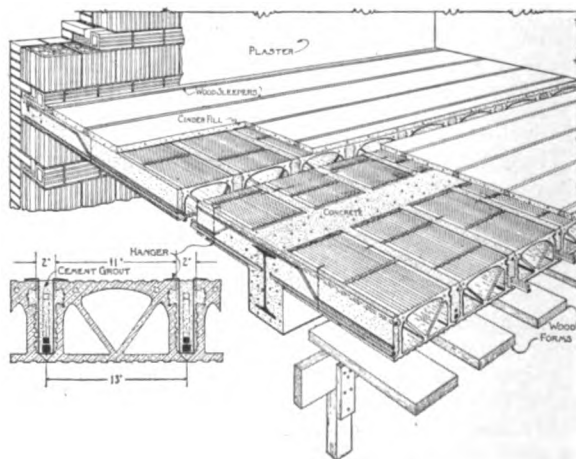


FIG. 3. PERSPECTIVE VIEW OF TYPICAL "NATCOFLOOR"

Note simple method of reinforcing; also economical wood centering, 2x8 in. under each joist is sufficient

Natco "Two-way" Floor System (Patented)

A later development of the "Combination" floor designed to carry loads to four sides in place of two, thus enabling designer to cut down thickness of slab and reduce depth of supporting girders. Most economical for bays, the ratio of whose sides does not exceed 1:1½; for long narrow spans "one-way" system is cheaper.

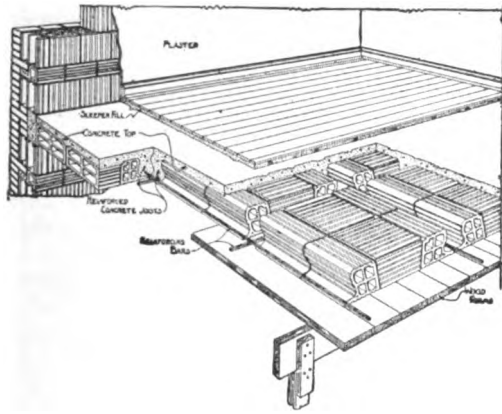


FIG. 4. PERSPECTIVE VIEW OF NATCO "TWO-WAY" FLOOR SYSTEM

Natco Segmental Arch

Combines great strength with lightness and cheapness. Suitable for warehouses, lofts, factories, side-walks or wherever a flat ceiling is not required. A flat suspended ceiling may be installed wherever deemed essential, such as used in the New York public schools, and in private houses, stores, etc. The 6-in. tile weighing approximately 32 lbs. per sq. ft. is the standard.



FIG. 5. TYPICAL SPAN OF NATCO SEGMENTAL ARCH

Natco Girder Covering

Hollow tile beam and girder covering is made in various forms to fit the flanges of all standard steel beams and girders. It is self-supporting except where the width to be covered is more than 6 in.; then the soffit is supported by metal clips.

Note—See Fig. 2 for typical girder covering.

Natco Column Covering

Steel and cast iron columns should be covered with at least 2 in. of hollow tile. Natco column covering can be furnished, both circular and square, for almost any type of column and from 2 to 4 in. in thickness. Covering for square columns can be made with rounded corners if necessary.

Natco Hollow Tile Partitions

Fireproof, soundproof, easily erected, and the standard for stability, especially where called upon to support plumbing fixtures, heavy picture frames, shelving, etc. Stock sizes 2 to 12 in. thick, laying up 1 sq. ft. of wall surface. A reasonable percentage of short lengths also furnished on request.

Natco Face Tile

For curtain or bearing walls of factories, warehouses, storage buildings, etc., Natco double shell tile in an 8-in. thickness, Natco smooth building tile and Natco XXX Tex tile in 3-, 4-, 6-, 8- and 10-in. thicknesses, with a reasonable percentage of corners, jambs, closures, sills, lintels and half-tile. When laid in a good cement mortar any one of these types produces an exterior surface of attractive finish without the addition of either stucco, plaster or paint.

A post card request will bring a copy of the new bulletin No. 174, "Natco Wall Construction."

Natco XXX Hollow Tile

For wall bearing and curtain wall construction—hard burned tile exposed or to be covered with cement stucco finish.

Natco XXX as compared with regular Natco merely represents added strength. Complete structural efficiency is realized in Natco XXX design in that every square inch of webs and shell is under direct compression when set in walls. Write for Bulletin No. 174, "Natco Wall Construction."

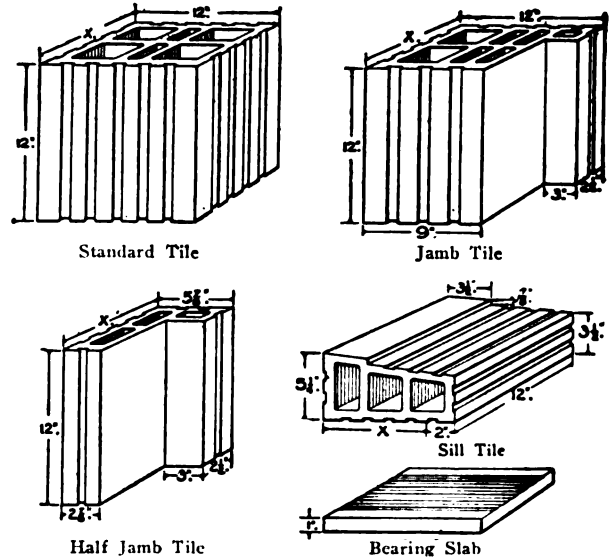


FIG. 6. TYPICAL SHAPES OF NATCO XXX HOLLOW TILE

Natco Lock Joint Sewer Tile

Triple lock, hermetically sealed. Manufactured from a specially selected, carefully prepared, hard burned clay thoroughly salt glazed.

The recesses of the inner tile are designed to receive projections on each outer tile, which produces a continuous irregular mortar joint for entire length of sewer. The tile also lap 6 to 9 in. horizontally and 3 to 4 in. radially, thus eliminating "through mortar joints." Descriptive catalogue mailed anywhere.

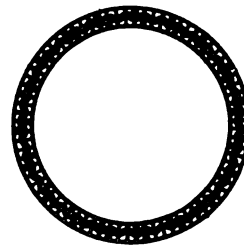


FIG. 7. Cross Section

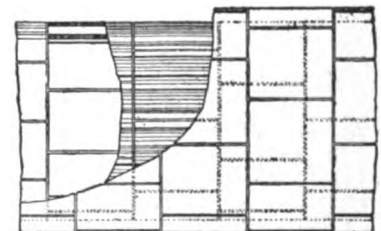


FIG. 8. Longitudinal View

NATCO LOCK JOINT SEWER TILE CONSTRUCTION
APPROXIMATE WEIGHTS, DIMENSIONS, ETC.

Diameter sewer, in.	Number double tile in circumference of sewer	Thickness of sewer, in.	Thickness inside wearing surface, in.	Area of wearing surface inside tile, sq. in.	Approximate weight of sewer, lbs. per foot
30	7	6	3/4	235	410
33	8	6	3/4	226	450
36	8	6 1/4	3/4	247	480
39	9	6 1/4	3/4	238	540
42	10	6 1/4	3/4	230	560
45	10	6 1/4	3/4	247	585
48	11	6 1/4	3/4	240	610
54	12	6 1/4	3/4	247	650
60	13	8	1	254	970
66	14	8	1	259	1000
72	15	8	1	264	1140
78	16	8	1	268	1170
84	18	9	1	257	1290
90	18	9	1	275	1400
96	20	9	1	264	1530
102	21	9	1	267	1630
108	22	10	1	270	1790

UNITED STATES GYPSUM COMPANY

Floor Tile

205 West Monroe Street
CHICAGO, ILL.

SALES OFFICES

NEW YORK, N. Y., 1170 Broadway
BUFFALO, N. Y., Ellicott Square
BOSTON, MASS., 77 Summer Street
WASHINGTON, D. C., 219 Woodward Building
PHILADELPHIA, PA., 133 South 12th Street
PITTSBURGH, PA., 1223 Oliver Building
CLEVELAND, OHIO, 646 Hanna Annex

LOS ANGELES, CAL., 902 Citizens' National Bank Building

CINCINNATI, OHIO, 52 Blymyer Building
DETROIT, MICH., 1360 Penobscot Building
MILWAUKEE, WIS., Grove and Oregon Streets
MINNEAPOLIS, MINN., 650 Builders' Exchange
KANSAS CITY, MO., 617 Bryant Building
OMAHA, NEBR., 522 Peters Trust Building
DENVER, COLO., 401 Boston Building

Products

PYROBAR FLOOR TILE.

Also manufacturers of Pyrobar Partition and Furring Tile; Pyrobar Beam and Column Covering. For Roof Tile, and Poured-in-place Floors and Roofs, see pages 123-125.

Engineering Service

Our Fireproofing Department is organized to co-operate with architects and engineers in the designing of floor systems.

Send in floor plans and the engineers will submit designs for a Pyrobar floor system together with specific information showing the advantages and economies obtained by the use of Pyrobar floor tile.

Pyrobar Floor Tile

Description—Pyrobar floor tile is made of "Structolite," a dense, specially prepared gypsum. The tile is cast with one end-piece integral, thus providing a seal for each row at the girders. Joist facers are made in standard widths of 5 in.; are 1 in. thick and 12 in. long. Special width facers can be furnished.

Advantages—Pyrobar floor tile is easily handled, and is rapidly and economically installed. No nailing is required to hold the tile in place on the forms.

A saving in reinforcing steel and concrete is assured when this tile is used, because its light weight reduces materially the dead load carried by joists and girders.

Form work is reduced to a minimum, as the large units are placed 24 in. on centers.

Spans up to 30 ft. are permissible with this system where light floor loads are involved.

Tests show that concrete poured against this tile is greatly increased in strength.

Pyrobar floor tile acts as a very efficient sound deadener, making it especially desirable for use in hospitals and schools. Used in roof construction, its high insulating value prevents condensation.

By using joist facers between the voids a uniform plastering base is obtained, thus obviating the use of metal lath.

Specification for Pyrobar Floor Tile

The floors and roof shall consist of the Pyrobar Floor Tile System of reinforced concrete construction, as shown on the accompanying plans, and all material and workmanship shall be in strict accordance with these plans and specifications.

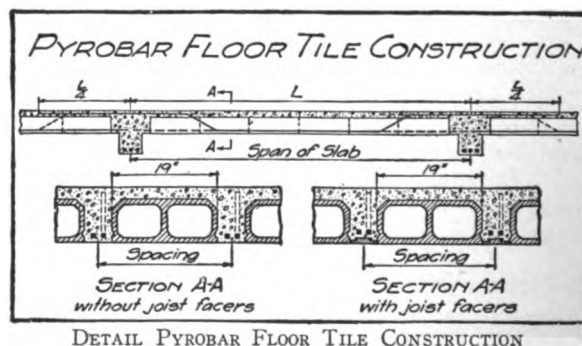
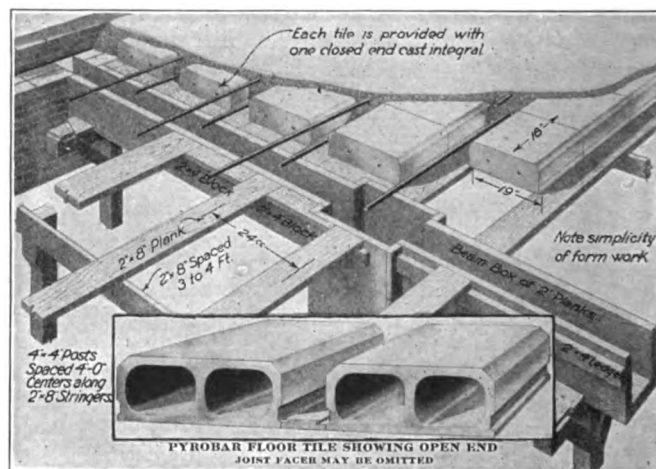
The tile for the floor and roof construction shall be Pyrobar Floor Tile, manufactured by the UNITED STATES GYPSUM COMPANY.

The tile shall be of the sizes indicated on the drawings.

The floor tile shall be accurately spaced to secure the exact joist widths shown. Pyrobar joist facers, if required, shall be

laid directly on the forms between the rows of tile. Care must be taken to see that the exact length of joists, as determined by the width of beam tee, is maintained.

In case this length is in odd feet and inches, the floor tile shall be sawed to fit. After all floor tile have been placed, wet tile and forms thoroughly before the concrete is poured.



		JOISTS WITHOUT FACERS					
		6"	8"	10"	12"	12"	
General Req.	Depth of Tile	6"	8"	10"	12"	12"	
	Width	5"	5"	5"	5"	6"	
2'	Spacing Center to Center	24"	24"	24"	24"	25"	
	Wt. of Conc. & Tile per Sq. Ft. of Floor Area	54*	60*	66*	76*	80*	
3'	Cu. Ft. of Conc. per Sq. Ft. of Floor Area	0.28	0.32	0.35	0.39	0.42	
	Sq. Ft. of Floor Area for One Yd. of Conc.	95	86	77	70	65	
3'	Core Area in per cent of Section	58	62	65	67	64	
	Wt. of Conc. & Tile per Sq. Ft. of Floor Area	66*	72*	80*	88*	92*	
3'	Cu. Ft. of Conc. per Sq. Ft. of Floor Area	0.36	0.40	0.43	0.47	0.51	
	Sq. Ft. of Floor Area for One Yd. of Conc.	74	68	62	58	53	
3'	Core Area in per cent of Section	51	56	60	62	60	
		JOISTS WITH FACERS					
		52"	59"	67"	75"	78"	
2'	Wt. of Conc. & Tile per Sq. Ft. of Floor Area	52*	59*	67*	75*	78*	
	Cu. Ft. of Conc. per Sq. Ft. of Floor Area	0.25	0.30	0.33	0.37	0.40	
2'	Sq. Ft. of Floor Area for One Yd. of Conc.	102	91	81	74	68	
	Core Area in per cent of Section	60	64	67	68	66	
3'	Wt. of Conc. & Tile per Sq. Ft. of Floor Area	64*	71*	79*	87*	90*	
	Cu. Ft. of Conc. per Sq. Ft. of Floor Area	0.35	0.38	0.42	0.45	0.49	
3'	Sq. Ft. of Floor Area for One Yd. of Conc.	78	71	65	60	55	
	Core Area in per cent of Section	54	58	61	64	62	

Weights of tile per lin. ft.: 6 in. deep, 26 lbs.; 8 in., 29 lbs.; 10 in., 35 lbs.; 12 in., 41 lbs.

THE SAMUEL J. CRESWELL IRON WORKS

Twenty-third and Cherry Streets
PHILADELPHIA, PA.

Products

CAST and WROUGHT IRON ENGINEERING SPECIALTIES and GENERAL FOUNDRY WORK, including Columns, Spiral Stairs, Wheel Guards, Manhole Doors and Frames, Roadway Drain Grates and Frames, Vault Plates and Frames, Ash Pit Doors and Frames, Trench Covers and Frames, Post Caps, etc.

Facilities

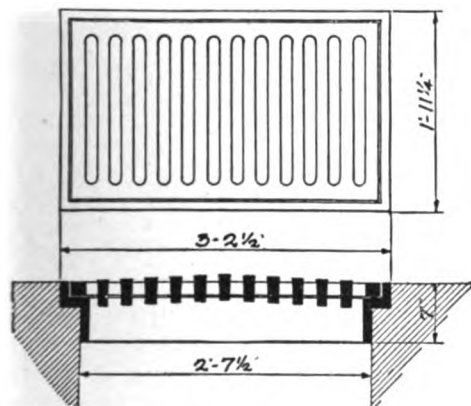
The SAMUEL J. CRESWELL IRON WORKS is one of the best equipped and largest plants in the vicinity of Philadelphia for the production of the various kinds of wrought and cast iron work mentioned above. Furthermore, this company is prepared to submit estimates, or designs and estimates, for any ornamental work for large or small buildings, etc., on short notice.

Stock Specialties

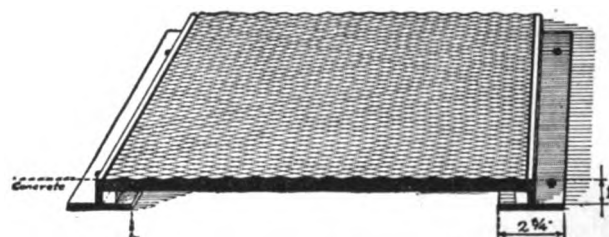
The accompanying illustrations show a few specialties regularly carried in stock. The prices quoted are f.o.b. Philadelphia.

Catalogue

A catalogue illustrating the entire line of manufacture will be sent on request.



No. 3 SEWER INLET
Price, \$22.00



COVER AND CURBING FOR DUCTS OR TRENCHES
Plates made to suit conditions. Curbing carried in stock.
Prices on application.



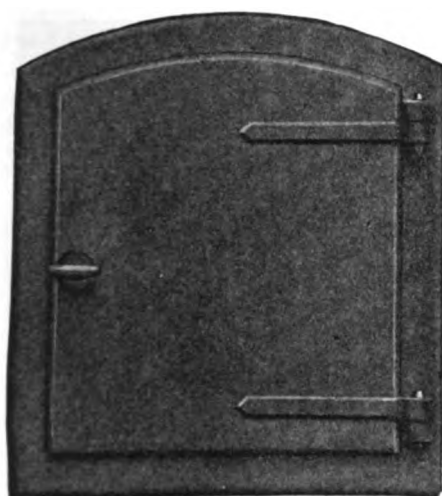
No. 11 ROADWAY DRAIN GRATE AND FRAME

11 x 22 1/4-in. grating \$6.00
8 1/4 x 17 1/4-in. grating 4.00



No. 10 ROADWAY DRAIN GRATE AND FRAME

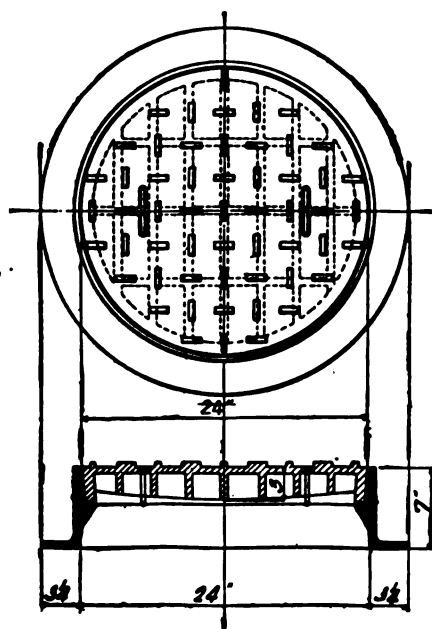
13 1/4 x 24 1/4-in. grating \$7.00
12 x 18-in. grating 6.00



No. 1 MANHOLE DOOR AND FRAME

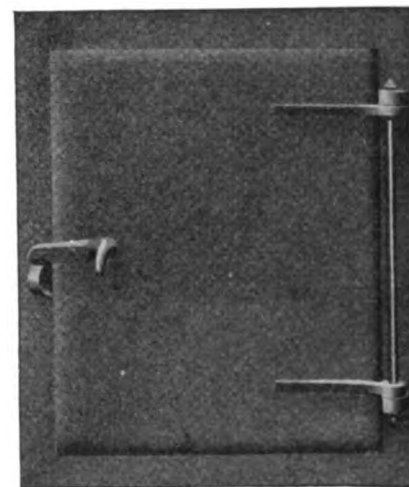
Width in.	Height in.	Price	Width in.	Height in.	Price
36	36	\$30.00	24	30	\$11.75
33	49	30.00	24	24	11.00
24	48	20.00	20	24	10.00
24	36	12.50	18	24	8.50

All manhole doors and frames have return flanges 4 in. deep.



No. 19 MANHOLE COVER

Extra heavy for city use \$17.00
With concrete or asphalt filled cover 22.00



No. 3 MANHOLE DOOR AND FRAME

Width in.	Height in.	Price	Width in.	Height in.	Price
24	24	\$11.00	16	20	\$7.25
18	24	8.50	12	16	4.50
18	18	7.50	12	12	4.00
16	24	8.00	12	10	3.50
			12	8	2.50

KEYSTONE GYPSUM FIREPROOFING CORPORATION

Marbridge Building, 34th Street and Broadway
NEW YORK, N. Y.

BRANCH OFFICES

PHILADELPHIA, PA., North American Building
WASHINGTON, D. C., Real Estate Trust Building

PITTSBURGH, PA., First National Bank Building
MONTREAL, QUE., 603 New Birks Building

Products and Service

The erection of METROPOLITAN SYSTEM of FIREPROOF FLOOR, ROOF and CEILING CONSTRUCTION.

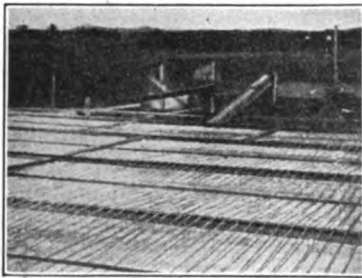
Also, erection of Gypsum Blocks for fireproof partitions, wall furring and column protection; Book Tile for steep roofs.



TRADE-MARK

Metropolitan System in Use for Quarter of a Century

For more than 25 years the Metropolitan System of fireproof floor and roof construction has demonstrated its practical advantages on installations scattered all over the United States and Canada, enduring under wide extremes of climatic conditions.



FORMS SET—DEFLECTION RODS IN POSITION

Repeat orders from the largest corporations in the country bear convincing testimony to its superior qualities; 72% of the orders booked in the last two years have been repeat orders. The following important installations are representative:

Bureau of Yards and Docks U. S. Navy (12 installations), 556,000 sq. ft.
Bethlehem Steel Co. (24 installations), 1,629,000 sq. ft.
Baldwin Locomotive Works (15 installations), 1,391,000 sq. ft.
Ingersoll-Rand Co. (5 installations), 595,000 sq. ft.
Scoville Mfg. Co. (6 installations), 332,000 sq. ft.
Midvale Steel Co. (6 installations), 468,000 sq. ft.
National Tube Co. (2 installations), 230,000 sq. ft.

Points of Superior Merit of Interest to Every Engineer

(1) **Safety and Strength**—Unlike ordinary reinforced concrete, which depends on compressive strength of concrete, tensile strength of steel and also on the assumption that a perfect bond between the two is formed, the Metropolitan System of construction is supported by continuous steel wire cables, securely fastened at each end and brought into deflection and tension, thus forming a system of suspension. Stresses are calculated by approved formulae, but crushing strength of Metropolitan composition is entirely disregarded. The combined high factor of safety makes Metropolitan System unqualifiedly the safest and strongest floor and roof slab construction.



POURING THE SLAB

(2) **Economy of First Cost**—Extreme lightness of Metropolitan construction permits us to replace other

less sturdy floors without either strengthening existing frame or overloading it. Light weight also permits wider purlin spacing thus saving tons of structural steel. The fact that composition can be mixed and placed faster than concrete, and sets more quickly makes for rapid construction—another point of economy.

(3) **Non-conductivity**—With consequent absence of condensation and substantial reduction in heating cost.

(4) **Durability**—Sections cut out of Metropolitan floors 20 years old have shown the steel to be in perfect condition.

(5) **Fire Resisting**—Its superior fire resisting qualities will enable you to write low insurance rates (see our booklet "Actual Tests").

(6) **Low Maintenance**—Great elasticity enables it to resist vibrations of moving loads without cracking.

(7) **Guaranteed Construction**—We guarantee every square foot of roofing or floor construction we lay against failure from any cause, under the conditions for which it was designed.

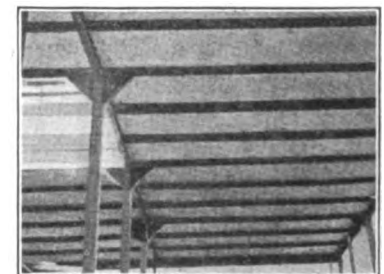
(8) **Service**—Each contract is a sale of service as well as of material and workmanship. Work completed is our greatest asset and we are just as interested in it 25 years later as on the day contract was signed.



READY FOR FLASHING

The Lightest Type of Fireproofing Floor or Roof Construction

Weights but 4 lbs. per sq. ft. per inch of thickness. For floors minimum thickness is 4 in.; for roofs, 3 in. Saving of steel that this affords is remarkable. In a certain large structure this was shown to amount to 5 lbs. per sq. ft. or 35% of total steel required in original design. In submitting bids our engineers will guarantee the estimate they make of saving of steel through the use of our system.



NOTE THE SMOOTH UNDER SURFACE

Can Be Installed More Rapidly Than Other Forms of Fireproof Construction

Metropolitan composition sets within 30 minutes after slab is poured; forms can be dropped within 60 minutes, leaving slab good for calculated loads.

STANDARD MONITOR TRUSS SHOWING DETAILS OF THE METROPOLITAN SYSTEM OF FIREPROOF ROOF CONSTRUCTION
OF THE KEYSTONE GYPSUM FIREPROOFING CORPORATION

LATHROP-HOGE CONSTRUCTION COMPANY

Engineers and Contractors for Gypsum Floors and Roofs

Union Central Building
CINCINNATI, OHIO

Products and Services

ENGINEERS and CONTRACTORS for MONOLITHIC CAST-IN-PLACE GYPSUM FLOORS and ROOFS.

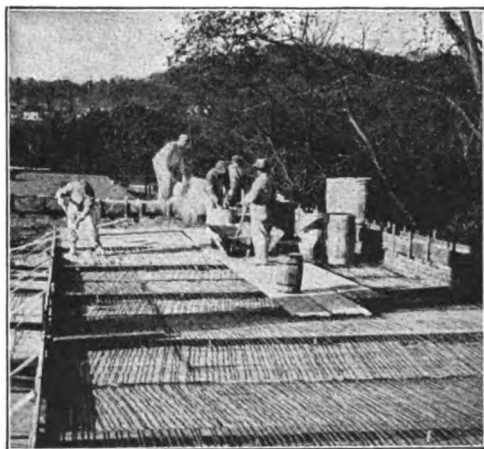
Also contractors for Gypsum Pre-cast Tile Roofs; Waterproofing: Built-up, Asphalt, Asbestos or Wool Felt; Partitions: Gypsum Block, Gypsum Board (Simplex) and Terra Cotta.

Gypsum—the Ideal Roof

Light Weight—Standard gypsum slab construction is one-third the weight of concrete (4 lbs. per 1 in. thickness) and lighter than any other fireproof roof on the market. Weighing no more than non-permanent wood construction, it will replace wornout sheathing without material change in supporting framing, with a strong, lasting, fireproof deck.

As compared with concrete, its light weight allows 33⅓% saving in truss and purlin tonnage. Longer spans between purlins and trusses will effect a substantial economy in framing as compared with tiles and other short span materials. Economic span is 6½ to 7 ft., using a 3-in. slab. Maximum span is 10 ft. 4 in. Substantially lower dead weight means smaller or more secure foundations, and fewer piles.

Time Saving Construction—Days and weeks saved in completion of erection mean less carrying charges to contractor and owner, and earlier return on investment. Gypsum—plaster of paris—sets within 20 minutes, permitting prompt removal of forms; and under suspension principle of design, full live load capacity is attained within an hour's time. Quick setting gypsum allows no interruption of work in freezing temperatures.



CABLES IN PLACE—POURING SLAB

High Insulation

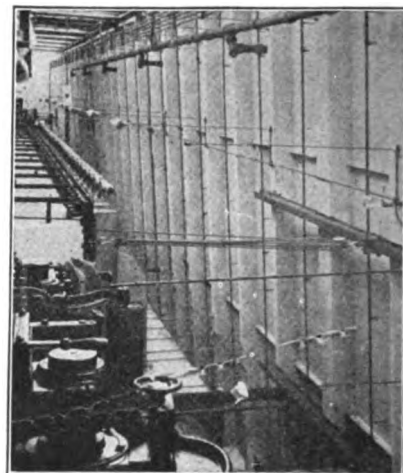
A roof is more than mere protection against the elements. It should retain heat in winter, and exclude the sun's radiation in summer. Our solid gypsum slab permits only one-third the heat loss of wood sheathing, one-fourth that of concrete of equal thickness, and less than one-seventh that of thinner makes of roofing. By using our solid gypsum slab, initial heating equipment may be reduced approximately 10% and fuel consumption cut 20% to 25% per season, thus repaying entire first cost in a few years.

High insulation also means *non-condensation* even under high humidity and a wide range of temperatures. Think of a paper-machine room roofed with a 4-in. solid gypsum slab, giving no drip under 80% humidity with 120° Fahr. inside and 30° below zero outside! Our permanent fireproof slab will solve condensation problems in power plants, foundries, paper mills, textile mills, etc., save money every day at the fuel bin and afford added comfort to employees.

Transmission through our standard gypsum roof slab per hour, per square foot, per degree difference in temperature inside and out is 3-in.=.17 B.t.u.; 3½-in.=.15 B.t.u.; 4-in.=.134 B.t.u. Insulation equivalent to 2 in. of gypsum is 1 in. of corkboard.

Fireproof—Fire resistive value of monolithic gypsum construction has been abundantly proved in official tests and actual fire experience. It has been approved as standard fireproofing for floors, roofs, partitions and column protection in first-class structures by Building Departments of the principal cities throughout the country for over 20 years. By using it on new buildings, or by replacing old roofs with this incombustible and permanent material, you may avoid a disastrous fire.

Strength—To the eye of layman and engineer, the stiffening value of a solid slab cast in place *between*



PAPER MILL INTERIOR
Purlins insulated with gypsum



MEAD PULP & PAPER CO., CHILLICOTHE, OHIO
Machine room roof erected by us

purlins instead of laid loosely over their top is apparent. At the same time, numerous cold drawn steel suspension cables anchored to end supports, run continuous and in deflection between purlins through slab, unifying and tying together the entire superstructure. Less bracing required for new buildings, and old buildings will be wonderfully stiffened by replacing roof with light, monolithic gypsum. Suspension principle allows design for any desired live load capacity of floors and roofs.

Resists Vibration—Position of slab between purlins cuts down tendency of superstructure to vibrate under cranes, hammers, or impact loads. Elasticity of gypsum composition successfully resists tendency of slab to crack under severe vibration conditions where all other constructions have failed. This factor, along with several others, influenced the Bureau of Yards & Docks, Navy Department, to adopt gypsum roofs for permanence in place of other constructions in 1916.

This toughness also permits expansion and contraction of structural frame without injury to slab. Co-efficient of expansion of gypsum is very small.

Permanence—The floors and roof of the St. Nicholas Skating Rink, 66th Street and Broadway, New York City—now 28 years old—were the earliest installations of this gypsum slab construction. Hundreds of office buildings, hotels, apartments, loft buildings, heavy and light machinestops, garages, etc., having millions of square feet of floors and roofs of gypsum slab construction, are giving satisfactory service, and without undue expense for upkeep or repair. This construction has *stood the test of time*, is reasonable in cost, light, economical from standpoint of plant operation, strong and fireproof. One prominent concern which has purchased over 6,000,000 sq. ft. of this construction during the past 10 years, states that, all factors considered, this is the most economical roof on the market.

Lathrop-Hoge Service—This company, backed by 9 years of experience in gypsum slab construction, is organized and equipped to fill all requirements. Their



TYPICAL UNDERSURFACE

engineering experience is at your service for advice and estimates on construction installed complete, including waterproof roof—a complete roof construction under a single contract.

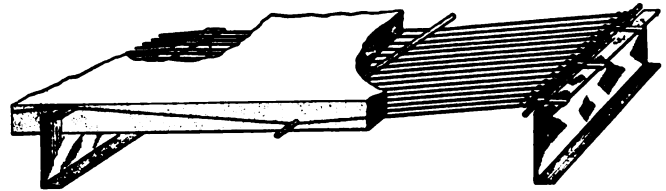
Specifications for Monolithic Slab

Floor and roof slabs named herein shall be standard suspension gypsum slab construction furnished and installed by the LATHROP-HOGE CONSTRUCTION COMPANY.

Cables, consisting of two No. 12, or equivalent, cold drawn, galvanized steel wires, twisted, shall be carried over tops of supporting beams or purlins and secured at ends by anchors, bars, or hooks of sufficient section of metal to develop maximum strength of cables. These cables shall be laid parallel and brought into

uniform deflection $\frac{3}{4}$ in. above undersurface of finished slab by round steel bars placed midway of each arch. Cables shall be spaced from 1 to $3\frac{1}{2}$ in. in accordance with requirements of suspension principle of design, based on factor of safety of 4.

Standard gypsum composition, containing at least 85% standard calcined gypsum, shall be mixed with water to a medium quaking consistency and poured into forms properly placed to make a slab between beams of the thickness required, the same to finish $\frac{1}{2}$ in. (roofs), or $\frac{3}{4}$ in. (floors), above tops of supporting framing. Top surface of slab shall be left ready to receive finish desired, such as fill, grading, or waterproofing.

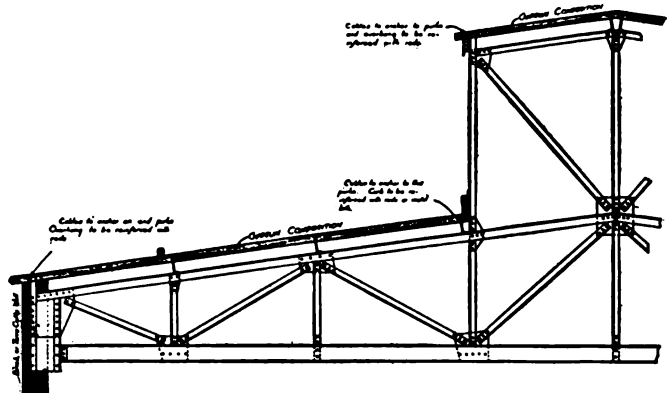


MONOLITHIC CAST-IN-PLACE GYPSUM FLOOR AND ROOF CONSTRUCTION

Overhangs beyond slab supports shall be constructed as above outlined, except that steel bars shall be used to reinforce same on cantilever principle, these bars to be carried back into main slab and secured to steel cables.

Curbs, walls, mullions, etc., shall be constructed with gypsum composition as above, sufficient steel reinforcement being provided to stiffen against wind pressure or other loading. Or such curbs, walls, mullions, etc., may be constructed of gypsum composition blocks laid up in gypsum mortar, all joints to be struck, and outer surfaces on roofs left ready for waterproofing.

With all floor construction, supporting steel beams shall be filled with gypsum composition under slab to bottom flanges. Where fireproof floors or roofs are desired, all beams and girders (but not roof trusses) shall be covered with a protection of standard gypsum composition 2 in. thick under bottom flange and $1\frac{1}{2}$ in. beyond flange at sides.



CROSS SECTIONAL VIEW OF MONOLITHIC CAST-IN-PLACE ROOF

Some Recent Installations

Tennessee Coal, Iron & R. R. Co., Fairfield, Ala.—Foundry
Carnegie Steel Co., Pittsburgh, Pa.—Machinestop
Bardes Range & Foundry Co., Cincinnati, Ohio—Foundry, floor and roof
American Car & Foundry Co., Terre Haute, Ind.—Machinestop
Ohio State University, Columbus, Ohio—Chemical laboratory
Telling Belle Vernon Co., Cleveland, Ohio—Powerhouse
Spanish River P. & P. Mills, Smoky Falls, Ont.—Powerhouse
Orr Felt & Blanket Co., Piqua, Ohio—Powerhouse
Pomeroy Salt Association, Pomeroy, Ohio—Powerhouse
Municipal Plant, Frankfort, Ind.—Powerhouse
Louisville Gas & Electric Co., Louisville, Ky.—Station
Prestolite Co., Indianapolis, Ind.—8 buildings
Cincinnati Coffin Co., Cincinnati, Ohio—Dry kiln
Escanaba Paper Co., Escanaba, Mich.—3 buildings
Hinde & Dauch Paper Co., Ft. Madison, Iowa—Machine room
Colin-Gardner Paper Co., Middletown, Ohio—Pump room
Spanish River P. & P. Mills, Espanola, Ont.—3 buildings
Spanish River P. & P. Mills, Sturgeon Falls, Ont.—2 buildings
Ft. William Paper Co., Ft. William, Ont.—2 buildings

STRUCTURAL GYPSUM CORPORATION

FORMERLY GYPSUM DEPARTMENT, H. H. ROBERTSON CO.

Manufacturers and Erectors of Structural Gypsum Roofs

53 Park Place
NEW YORK, N. Y.

BRANCH OFFICES

BOSTON, MASS., 50 Congress Street
BUFFALO, N. Y., 908 Mutual Life Building
PHILADELPHIA, PA., Real Estate Trust Building
PITTSBURGH, PA., First National Bank Building

ALLENTOWN, PA., 446 Union Street
EASTON, PA., 233 Ferry Street
SCRANTON, PA., Board of Trade Building
RICHMOND, VA., American National Bank Building

FACTORIES: AKRON, N. Y., and GYPSUM, OHIO

Products

Manufacturers and erectors of GYPSTEEL PRE-CAST and POURED-IN-PLACE FLOORS and ROOFS.

Also manufacturers of Gypsum Partition Blocks, etc.

Gypsteel Roof Construction

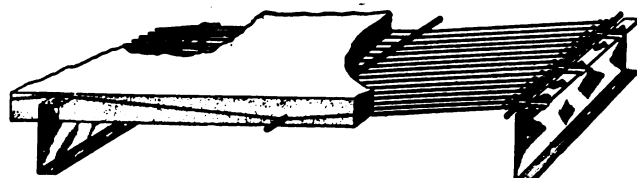
Gypsteel roof construction is a *steel "suspension bridge"* supporting gypsum. It is built in both *poured-in-place* and *pre-cast* form. It combines maximum strength with minimum weight. It is designed for any desired loads by accepted engineering formulas.

Gypsteel Poured-in-place-Roofs

The design of Gypsteel roof construction is based on the principle of the suspension bridge. Cables of cold drawn steel wire are spaced from 1 to 3 in. apart (depending on spans and loads) and are securely anchored at both ends of a series of purlins by means of bars or hooks of a section of metal sufficiently heavy to develop the maximum strength of the cables. These cables are put into uniform deflection and tension between each pair of beams or purlins by means of continuous deflection rods.

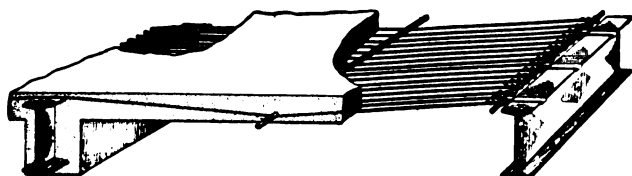
Gypsteel composition is then poured-in-place *between* the purlins, on wood forms or centering and is brought to a level surface about $\frac{1}{2}$ in. above the top flanges of the purlins. It is then ready for the waterproof roofing. This composition consists of a scientifically calcined gypsum, with which is incorporated wood fiber that serves as a binder and imparts to the slab its peculiar toughness and elasticity.

Use in Floor Construction—The poured-in-place type of construction has been approved for many years as standard fireproofing for floors as well as roofs by the building departments of the principal cities throughout the country.



TYPE NO. 1. GYPSTEEL POURED-IN-PLACE ROOFS

The type of construction usually employed for flat, pitched or saw-tooth roofs, when supported by trusses either with or without purlins

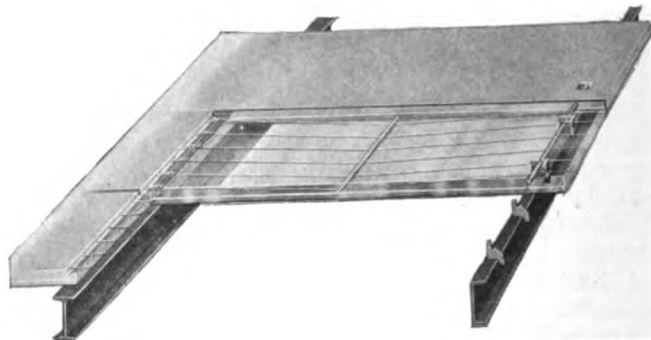


TYPE NO. 2. GYPSTEEL POURED-IN-PLACE ROOFS

For roofs where complete fire protection is required, or where especially severe conditions of humidity and high temperature might cause condensation to form on projecting webs and flanges of purlins if left exposed

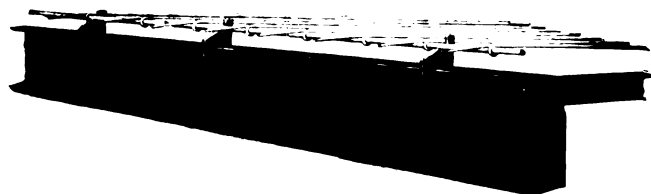
Gypsteel Pre-cast Roofs

As in the case of the Gypsteel poured-in-place gypsum roof, the Gypsteel pre-cast slab construction is designed on the principle of the suspension bridge. Gypsteel pre-cast construction is, in effect, a monolithic roof after the erection is completed. The slabs are moulded in steel forms, into which the steel cables are placed and put into uniform deflection and tension by means of the same deflection rods, restrained at the sides of the moulds. The cables are securely anchored to the moulds at points beyond the ends of the slab, being removed from this anchorage when the gypsum is set, each cable emerging from the ends of the slab within $\frac{1}{2}$ in. of the top surface and projecting about 2 in.



GYPSTEEL PRE-CAST ROOFS

Details of design, cable ties, anchorage, grouted end and side joints and anchor slots



GYPSTEEL PRE-CAST ROOFS

Showing perfect mechanical anchorage of steel in slabs to the steel framework of building, independent of the gypsum

When these slabs are set in place on the purlin with their ends abutting, the projecting ends of the opposite cables in each slab are tied together by a mechanical device which draws them up taut at these connections; and as the ends of the slabs are rabbetted where the cables emerge, these ties lie in depression filled with a grout of the same composition, firmly embedding the ties and troweled off with the top surface of the slab.

Innumerable load tests, which have been made on Gypsteel pre-cast slab construction, have shown that in every instance it will sustain more than the factor of safety of 4 for which the supporting steel cables in deflection and tension are designed.

Principal Advantages of Gypsteel Roof Construction

Economical First Cost—Its extreme lightness in

weight and adaptability to wider purlin spacings effect substantial savings in the total steel tonnage of the purlins, trusses and columns so as to make it the most economical first class type of roof construction.

Saving in Heating—The gypsum composition used in forming the slab is the most remarkable non-conductor of heat of any known structural material, thus it minimizes heat loss through the roof, reducing substantially the consumption of coal and effecting saving in initial cost of a heating plant and subsequent operating expenses.

Preventing Condensation—Gypsteel roof construction pre-insures against the forming of condensation on the underside of the roof.

Time Saving—Gypsteel pre-cast slabs are manufactured at the factory and are all made and shipment started when the erection of the steel work is begun. This permits of the laying of the roof deck, proceeding as rapidly as the steel is erected ahead of it, and the waterproofing can follow the slab erectors just as closely.

Elasticity—Gypsteel successfully resists the most severe vibrations without trace of cracking.

Fire Resisting—Gypsteel meets all of the most exacting requirements of a standard fireproof material. During tests, sustained temperatures of from 1700° to 2100° Fahr. for 4 to 5 hours, had no effect beyond a slight depth of recalcination on the exposed surface.

Corrosionproof—The composition used in Gypsteel roof construction has been proved by more than 20 years experience to be a perfect preservative of incased steel against corrosion.

Non-expansive—Gypsteel gypsum roofs will neither expand nor contract and are therefore free from cracks, spalling and internal stresses, which frequently occur in concrete and other similar materials.

Attractive Appearance—Gypsteel roofs, when painted, present a much more attractive appearance underneath than any other type of roof remaining unplastered.

Replacement of Old Roofs—The replacement of old roofs is readily accomplished by the use of Gypsteel construction, as its lightness in most cases renders increased steel work unnecessary.

SAFE LOADS. PRE-CAST ROOF CONSTRUCTION

Slab width, in.	Cable spac. in.	Number cables per slab	Distance between supports center to center, ft.-in.													
			4-0	4-3	4-6	4-9	5-0	5-3	5-6	5-9	6-0	6-3	6-6	6-9	7-0	
24	4	6	136	122	108	98	88	80	72	66	61					
21	3.43	7	159	142	126	114	102	93	84	78	72					
	4.2	5									59	54	50	46		
	3.5	6									70	64	59	55		
18	3	7									82	76	70	65		
	2.62	8									94	87	80	74		
	3.6	5												54	50	
	3	6												65	60	
	2.57	7												76	70	

$W=1152 \frac{Td}{bL} (L^2+16d^2)^{\frac{1}{2}}$ where W =safe load; T =cable strength=0.0274 (area of $\frac{3}{8}$ -in. cold drawn steel-wire rods) \times 20,000 (unit working stress)=552 lbs.; d =deflection of wires in inches; b =cable spacing in inches and L =clear span in inches.

Slab thickness in all cases, 3 in., weight 14 lbs. per sq. ft.

Note: While this table is not extended beyond the usual range of roof loads, slabs will be designed and furnished for any greater load capacities which may be desired, in order to meet special conditions. This is accomplished by decreasing the cable spacing for any given span.

Installation

Gypsteel poured-in-place roof construction is installed only by our own field organization.

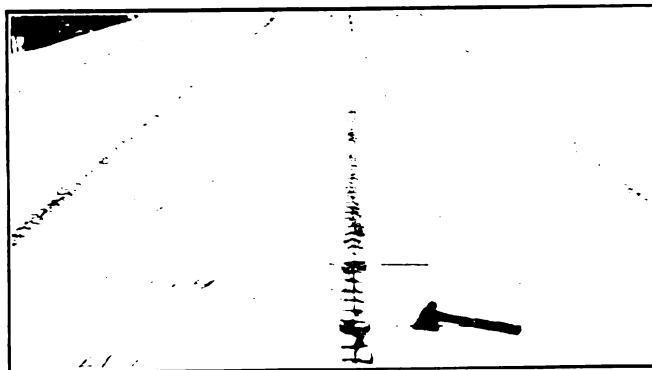
Gypsteel pre-cast slab construction is also installed by our own field organization. Where desired, however, contracts will be taken for furnishing Gypsteel pre-cast slabs f. o. b. cars factory with freight allowed to destination, and we will loan one of our experienced foremen to the contractor or owner to supervise the erection, for which no charge is made other than his actual time and expenses.

Estimates and Designs

Complete proposals for furnishing and installing Gypsteel roofs will be promptly furnished on request. When it can be done conveniently, we suggest sending plans to our nearest sales office. This permits of our Engineering Department going over all of the details of the steel design and incorporating in our proposal an accurate estimate of the total tonnage of steel which

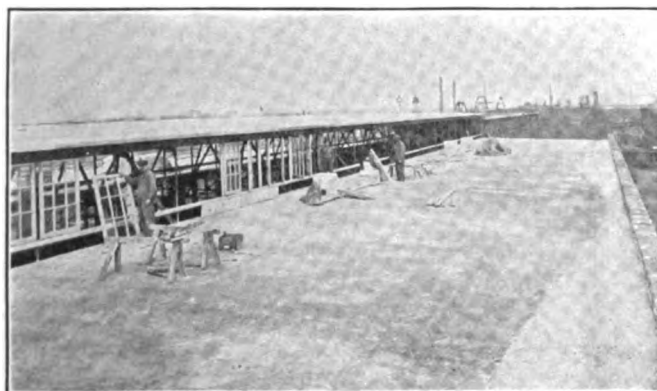
can be saved by reason of the lightness in weight of Gypsteel roofs, and their adaptability to wider purlin spacing than most other roofs.

Where plans have not yet been drawn, our Engineering Department will gladly offer suggestions or co-operate in the preparation of the steel design to develop the maximum economy by the use of Gypsteel roofs. This service is gratis, and imposes no obligation whatsoever on an architect, engineer or owner.



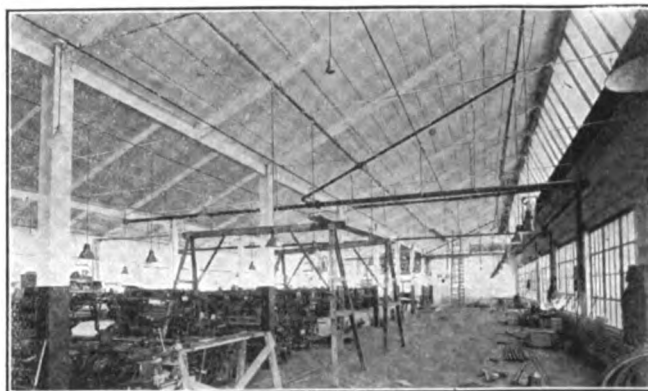
GYPSTEEL PRE-CAST SLAB CONSTRUCTION

Close up view of table ties. Note that grouting is used in the side as well as end joints, giving in effect, a monolithic slab construction



GYPSTEEL PRE-CAST SLAB CONSTRUCTION

Roof grouted, crickets graded to downspouts, ready for waterproofing



GYPSTEEL PRE-CAST SLAB CONSTRUCTION

Showing underside of sawtooth roof, painted

H. E. MARKS, INC.

Reinforced Gypsum or Concrete Roof Construction

813 Empire Building
PITTSBURGH, PA.

Product

THE MARKS SYSTEM OF ROOF CONSTRUCTION (Patented Nov. 22, 1921, No. 1398079).

Marks System of Roof Construction

Description—The Marks System consists of steel Ts, supported on roof purlins, gypsum board panels, wire mesh reinforcement, and a cast-in-place gypsum or concrete slab.

Details and Construction—Two sizes of Ts are used. The large main Ts span from purlin to purlin, spaced 2 ft. 8 in. apart. These Ts are laid in one or more pieces, as size of roof requires, and are secured at eaves, and to one or more of the purlins.

The small or auxiliary Ts are 2 ft. 8 in. long and are simply laid (not fastened) in the main Ts, to support end of gypsum board at 3-ft. intervals.

As auxiliary Ts are laid, the standard sized 2 ft. 8 in. x 3 ft. gypsum board panels are placed in position, being supported along their four sides by legs of the auxiliary and main Ts.

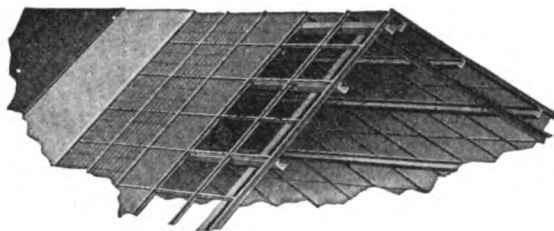
After a row of panels has been placed, the reinforcing fabric of proper width, cut to exact length of the roof, is laid over the Ts.

Forms are now ready for the aggregate, which is poured into place, forming, with wire fabric, a solid monolithic reinforced slab, of which the gypsum board and Ts become an integral part.

Note—Gypsum board panels fit snugly in their places, which eliminates possibility of leakage of aggregate. Underside of roof is "finished" even before aggregate is placed. Gypsum board and Ts can be painted, but it is an unnecessary expense when roof is built by the Marks System.

The spacing of the Ts and the sizes of the gypsum board panels and of the reinforcing fabric can be varied to suit special conditions—the dimensions above given being for standard practice.

Waterproofing—The usual type of waterproofing can be placed on top of the slab.



MATERIALS REQUIRED IN BUILDING A MARKS SYSTEM ROOF

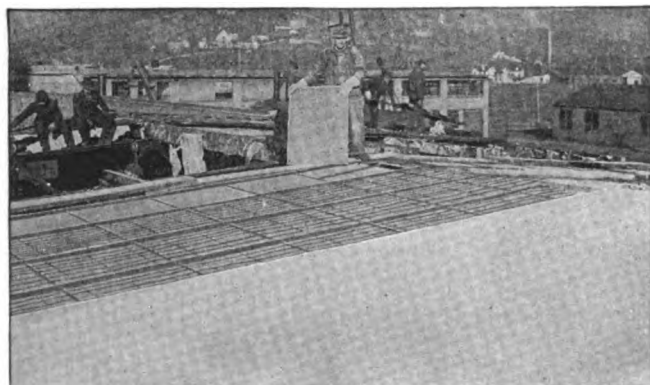
SAFE LOADS FOR MARKS SYSTEM OF ROOF CONSTRUCTION

Thick- ness of slab, in.	Weight of slab, lbs. per sq. ft.	Reinforcing		Span of Slab in Feet													
		A. S. & W., gauge	Spac- ing, in.	4	4½	5	5½	6	6½	7	7½	8	8½	9	9½	10	
				Safe superimposed loads in pounds per sq. ft. (weight of slab has been deducted).													
2½	11	8	4	68	52	40	31	24	19								
2½	11	7	4	73	56	43	34	26	21								
2½	11	6	4	79	60	46	37	29	23	18							
2½	11	5	4	83	63	49	39	31	24	20							
2½	11	4	4	88	67	52	41	33	26	21							
3	13	8	4	102	79	60	48	38	30	24	20	16					
3	13	7	4		83	65	51	41	33	27	22	17					
3	13	6	4		89	70	56	45	36	29	24	19	16				
3	13	5	4		94	74	59	47	38	31	26	21	17				
3	13	4	4		100	79	63	51	41	34	28	23	19				
3½	15	8	4	97	76	60	48	38	31	25	20	16					
3½	15	7	4		91	72	58	47	39	32	26	21	17	14			
3½	15	6	4		97	78	63	50	42	35	29	24	19	16			
3½	15	5	4		83	67	54	45	37	31	26	21	18	14			
3½	15	4	4		85	69	56	46	39	32	27	22	19	15			
4	17	7	4	88	71	57	48	40	33	27	22	18	15				
4	17	6	4		82	66	55	46	38	32	27	22	18	15			
4	17	5	4		89	72	61	51	42	36	30	25	21	18			
4	17	4	4		96	78	66	55	46	39	33	28	23	19			
4½	19	7	4	82	66	55	46	38	31	26	21	17	14				
4½	19	6	4		80	67	56	47	39	33	28	23	19	15			
4½	19	5	4		91	77	65	54	46	39	33	28	23	19			
4½	19	4	4			82	70	59	50	42	36	31	26	21	17		
Size of T-beam, in.				Safe load in pounds per square foot uni- formly distributed for longitudinal T-beam													
1½x1½x¾				34	27	21	18	15	13	11							
2x2x½						51	43	36	30	26	23	20					
2½x2½x¾										41	36	32	28	25	22	20	

NOTES—Bending moment, $M=1/10 w l^2$; unit stresses, fs, 16000. fg, 220.

Total safe load equals sum of safe load for slab and safe load for longitudinal T-beam. Thickness of slab includes the gypsum board.

Illustration—At the extreme right of the accompanying illustration is the underside of a completed roof. The left pitch of roof is divided into 5 sections as follows: (1) Ts in place; (2) Gypsum board panels in position; (3) Fabric reinforcement stretched over Ts; (4) Gypsum aggregate; (5) Standard waterproofing finish.



REPLACING WOOD ROOF WITH THE MARKS SYSTEM ON THE MACHINESHOP OF DRAVO CONTRACTING CO., PITTSBURGH
New roof is installed without the use or necessity of "form work" of any kind



INTERIOR VIEW OF THE DRAVO CONTRACTING CO. MACHINESHOP, PITTSBURGH
Note light, clean ceiling, which is an integral part of roof, and which is completely finished as roof is laid

UNITED STATES GYPSUM COMPANY

Reinforced Roof Tile; Monolithic Roofs and Floors

205 West Monroe Street
CHICAGO, ILL.

SALES OFFICES

NEW YORK, N. Y., 1170 Broadway
BUFFALO, N. Y., Ellicott Square
BOSTON, MASS., 77 Summer Street
WASHINGTON, D. C., 219 Woodward Building
PHILADELPHIA, PA., 133 South 12th Street
PITTSBURGH, PA., 1223 Oliver Building
CLEVELAND, OHIO, 646 Hanna Annex

LOS ANGELES, CAL., 902 Citizens' National Bank Building

CINCINNATI, OHIO, 52 Blymyer Building
DETROIT, MICH., 1360 Penobscot Building
MILWAUKEE, WIS., Grove and Oregon Streets
MINNEAPOLIS, MINN., 650 Builders' Exchange
KANSAS CITY, MO., 617 Bryant Building
OMAHA, NEBR., 522 Peters Trust Building
DENVER, COLO., 401 Boston Building

Products

Manufacturers and erectors of PYROBAR REINFORCED ROOF TILE (made of Structolite) for Roof Decks; PYROFILL MONOLITHIC FLOOR AND ROOF CONSTRUCTION.

For Pyrobar Floor Tile, see page 114.

Services

Twenty-one producing mills, located at advantageous points, insure prompt delivery for any quantity.

An Engineering and Construction Department is maintained for the purpose of assisting engineers and architects in designs and estimates, and is desirous of submitting erected bids on Pyrobar Roofs, and Pyrofill Roofs and Floors.

Pyrobar Reinforced Roof Tile

Pyrobar roof tile are made of Structolite, a specially prepared, hard, dense gypsum, reinforced with steel and designed to carry the full required roof load. These tile are manufactured in two general types: Long span (either hollow or channel sections), and 30-in. type (solid and hollow).

The long span tile are made either with or without lap joint, the lap joint tile being designed chiefly to meet construction difficulties, such as where purlins are not in true alignment or where sufficient flange bearing has not been provided to receive standard section tile.

Advantages—Strength—Pyrobar roof tile are designed to carry 50 lbs. per sq. ft., total uniform load, with a factor of safety of 4.

Fireproof—Gypsum is acknowledged to be one of the best fire resisting materials known. Gypsum will not support combustion or conduct heat; neither has it appreciable contraction nor expansion; consequently, it will not warp, buckle or spall under severe fire.

Minimizes Condensation—Superior heat insulation is a salient feature of Pyrobar tile. Tests give the fol-



STEEL FRAME READY FOR 30-IN.
TYPE PYROBAR



PYROBAR APPLIED TO
STEEL

lowing values of B.t.u. transmitted per sq. ft. per hour, per degree Fahrenheit difference in temperature, for various roof deck materials:

	B. t. u.
2-in. yellow pine plank.....	0.385
3-in. solid concrete slab (1-2-4).....	0.750
1½-in. solid cement tile.....	0.990
3-in. solid gypsum roof tile.....	0.250
4-in. hollow gypsum roof tile.....	0.200

Less heat is transmitted through gypsum than through any of the other materials. On account of its low conductivity, the under surface of Pyrobar roof deck remains at practically the same temperature as the air of the interior of the building, regardless of changes of external temperature. Under these conditions, no "sweating" or "dripping" can occur and condensation of moisture is eliminated.

Heat Saving—The superior heat insulation value shows a decided saving compared to a concrete slab, in tons of fuel used for heating purposes and also in heating plant installation.

Light Weight—Pyrobar tile are 50% lighter than concrete per square foot of surface for equal thickness, which, therefore, results in considerable saving in steel framing.

Adaptability—Suited to any form of roof design, flat or peaked, and easily cut and fitted.

A slate or ornamental tile may be nailed directly to Pyrobar long span channel section roof tile if "Extra Thick Nailing Deck" is specified; also to Pyrobar 30-in. solid type if "Extra Dense" is specified.

Quickly Erected—The large, light weight units are very quickly installed during any weather conditions and their erection does not interfere with plant operations going on below.

Light Diffusive—The under surface of the roof is white, uniformly smooth and light reflecting, assisting in the solution of the lighting problem.

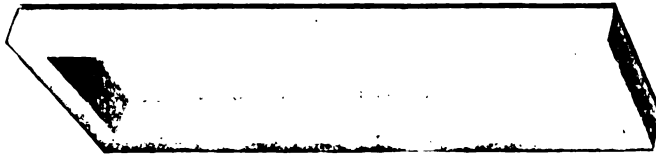


PYROBAR LONG SPAN TILE
Spanning from purlin to purlin

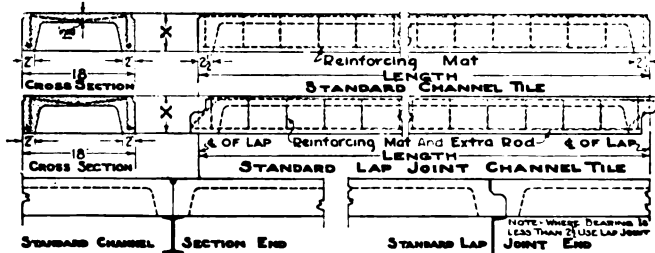
Permanency—The permanency of Pyrobar tile has been established through many years of use. The tile are not affected by the chemical action of smoke or the deteriorating action of sulphuric acid fumes; thus maintenance cost is eliminated.

Pyrobar Long Span Roof Tile

Long Span Channel Type—This type of tile is manufactured in 4- to 8-ft. lengths. The tile are laid directly on steel or wood framing.



PYROBAR LONG SPAN CHANNEL TYPE

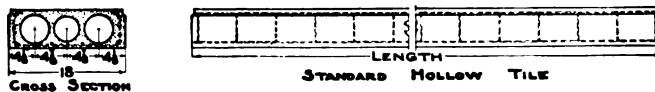


DETAILS, PYROBAR LONG SPAN CHANNEL TYPE WITHOUT AND WITH LAP JOINT

WEIGHTS, LONG SPAN CHANNEL AND HOLLOW TYPE TILE

	Channel Tile		Hollow Tile
	0' to 6'3"	6'3" to 8'0"	0' to 8'0"
Length.....			
Depth, "X," in.....	5	6	6
Wt. per sq. ft., lbs.....	17	19	25

Long Span Hollow Type—The "hollow" type tile are manufactured in the same lengths as the "channel" type up to 8 ft.; the hollow type, however, provides a flat and better light reflecting ceiling, with maximum insulation. This type can also be furnished with lap joint.



PYROBAR LONG SPAN HOLLOW TYPE

PURLIN TABLE FOR LONG SPAN CHANNEL OR HOLLOW TYPE TILE, OR 30-IN. TILE ON TEES

Total uniform dead load of 50 lbs. per sq. ft.

PURLIN SPAN		8'-0"	10'-0"	12'-0"	14'-0"	16'-0"	18'-0"	20'-0"	22'-0"	24'-0"	
SHAPE		I	C	I	C	I	C	I	C	I	C
SLAB - SPAN	DEPTH - INS	3	4	4	4	5	5	6	7	7	8
	WT. PER FT. LB	5 1/2	5 1/2	7 1/2	7 1/2	8 1/2	9 1/2	12 1/2	15 1/2	15 1/2	18 1/2
	DEPTH - INS	3	4	4	5	5	6	7	7	8	10
	WT. PER FT. LB	5 1/2	5 1/2	7 1/2	7 1/2	8 1/2	9 1/2	12 1/2	15 1/2	15 1/2	18 1/2
	DEPTH - INS	4	4	5	5	6	6	7	7	8	10
	WT. PER FT. LB	7 1/2	7 1/2	8 1/2	8 1/2	9 1/2	9 1/2	12 1/2	15 1/2	15 1/2	18 1/2
	DEPTH - INS	4	5	5	6	6	7	7	8	9	12
	WT. PER FT. LB	7 1/2	8 1/2	8 1/2	9 1/2	9 1/2	10 1/2	13 1/2	16 1/2	16 1/2	21 1/2
	DEPTH - INS	4	5	5	6	6	7	7	8	9	12
	WT. PER FT. LB	7 1/2	8 1/2	8 1/2	9 1/2	9 1/2	10 1/2	13 1/2	16 1/2	16 1/2	21 1/2
	DEPTH - INS	4	5	5	6	6	7	7	8	9	12
	WT. PER FT. LB	7 1/2	8 1/2	8 1/2	9 1/2	9 1/2	10 1/2	13 1/2	16 1/2	16 1/2	21 1/2

DESIGNING DATA

Spans for various T-irons spaced 30 3/4 in. on centers

Span...	Up to 3' 3"	5' 3" to 5' 10 1/2"	5' 10 1/2" to 6' 5 1/2"	6' 5 1/2" to 8'
Size T-iron	2 1/4" x 2 1/4" - 4.1 lbs	2 1/4" x 2 1/4" - 4.9 lbs	2 1/4" x 2 1/4" - 5.5 lbs	3" x 3" - 6.7 lbs

30-Inch Type Pyrobar Roof Tile

Made in hollow and solid types, surface measurements 12 by 30 in.; solid type 3 in. thick; hollow or cored type 3 1/2 in. thick. (Note: 4-in. hollow tile will be furnished on special order.) Adapted for curved or other intricate roof designs and easily cut to fit any requirements. The tile are placed on T-iron purlins spaced on 30 3/4-in. centers.

Curbs or walls for monitor and sawtooth sash are built of 3-in. solid Pyrobar tile; the end walls of monitors and sawteeth are similarly built, the roof covering being extended to cover curbs and end walls.

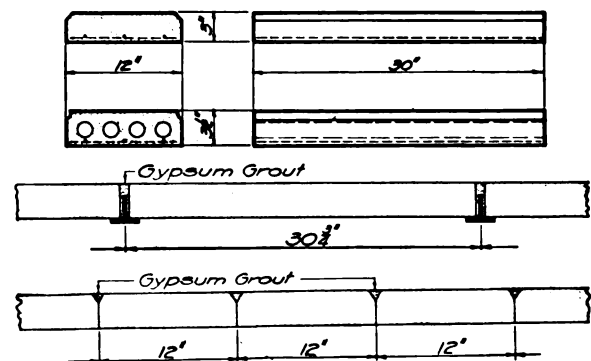
Where it is necessary to build up roof for drainage purposes, a material known as "drainage fill" is supplied, which is a combination of gypsum and cinders or wood chips that sets within 30 minutes after being placed, permitting application of roof covering without delay.



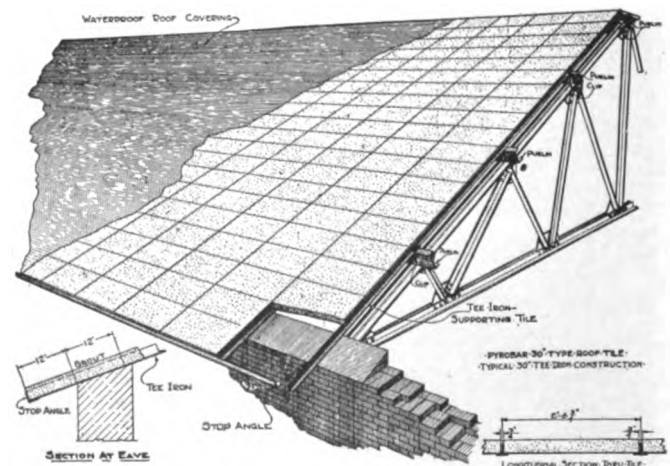
30-INCH PYROBAR ROOF TILE

	Solid 3"	Hollow 3 1/2"
Depth.....	30"	30"
Length.....	15 lbs.	15 lbs.
Wt., sq. ft.....		

Wt. of 3" extra dense, 17 lbs.



SECTIONS OF 30-INCH TILE SHOWING JOINTS OF GYPSUM GROUT



DETAILS OF 30-INCH TYPE PYROBAR ROOF TILE CONSTRUCTION

Specifications for Pyrobar Roof Tile

Long Span Channel Type; Long Span Hollow Type— All roofs as shown on drawings, unless otherwise noted, shall be constructed of Pyrobar Long Span Reinforced Roof Tile (specify whether channel or hollow type and also if lap joint shall be used), manufactured by the UNITED STATES GYPSUM COMPANY. The tile shall be placed directly upon roof supports without mortar and with sides tight together. All joints on top surface of roof are to be pointed with gypsum mortar composed of 1 part unfibred gypsum cement plaster and 2 parts of clean, sharp sand.

Curbs under monitor and sawtooth sash, also end walls of monitors and sawteeth, shall be constructed of 3-in. solid Pyrobar Tile set in gypsum cement mortar, the joints being well bedded and struck.

Note: Where slate or ornamental tile is to be nailed directly to the roof deck, the above specification should read, "shall be constructed of Pyrobar Long Span Type Reinforced Roof Tile with extra thick nailing deck."

Cut nails or barbed slaters' nails having a penetration of not less than $1\frac{1}{4}$ in. into the Pyrobar tile shall be used to fasten the slate or ornamental tile.

30-in. Type, 3-in. Solid or $3\frac{1}{2}$ -in. Hollow— All roofs as shown on plans, unless otherwise noted, shall be constructed of (3x12x30-in. solid) or ($3\frac{1}{2}$ x12x30-in. hollow) Pyrobar Reinforced Roof Tile manufactured by the UNITED STATES GYPSUM COMPANY. The tile shall be laid tightly together on T-irons without mortar, all joints on top surface of roof to be pointed with gypsum mortar composed of 1 part unfibred gypsum cement plaster and 2 parts clean, sharp sand.

Curbs under monitor and sawtooth sash, also the end walls of monitors and sawteeth, shall be constructed of 3-in. solid Pyrobar tile set in gypsum cement mortar, joints to be well bedded and struck. (The foregoing curb specifications can also be used for 4-in. solid tile.)

Note: Where slate or ornamental tile is to be nailed directly to the roof deck, specification should read, "shall be constructed of 3x12x30 in. Solid Reinforced, Extra Dense Pyrobar Roof Tile."

Cut nails or barbed slaters' nails shall be used to fasten roof covering, and shall have at least $1\frac{1}{2}$ in. penetration into tile.

Pyrofill Monolithic Floor and Roof Construction

An economical form of poured-in-place construction. Formwork is provided the same as required for concrete slab; steel cables are laid across the purlins and

securely fastened. The principles in its design are the same mathematically as those of a suspension bridge, and its strength can be calculated with the same accuracy. A transverse steel rod is laid across the cables at the center of each span so as to secure uniform deflection.

This type of roof is made of Pyrofill, a specially calcined gypsum mixed with a definite proportion of wood shavings. Pyrofill requires only the addition of water to make it the required consistency. It is poured on the reinforcing and leveled off to the specific thickness of slab.

Weight of roof slabs: 3-in. slab, 12 lbs.; $3\frac{1}{2}$ in., 14 lbs.; 4-in., 16 lbs.; $4\frac{1}{2}$ -in., 18 lbs.; 5-in., 20 lbs.

Specifications for Pyrofill Monolithic Floor and Roof Construction

Unless otherwise shown, all roof slabs shall be constructed of poured gypsum, using the system of the UNITED STATES GYPSUM COMPANY known as Pyrofill Gypsum Roof. This contractor shall provide necessary forms, reinforcing cables, Pyrofill and all labor required. The forms shall be made in a workmanlike manner of dressed and matched lumber and shall be carefully leveled up so as to insure a uniform depth of slab.

Reinforcing shall consist of steel cables made by twisting two No. 12 wires. These cables shall be calculated to take the entire roof load and shall be fastened at their ends in such manner as to develop the full strength required.

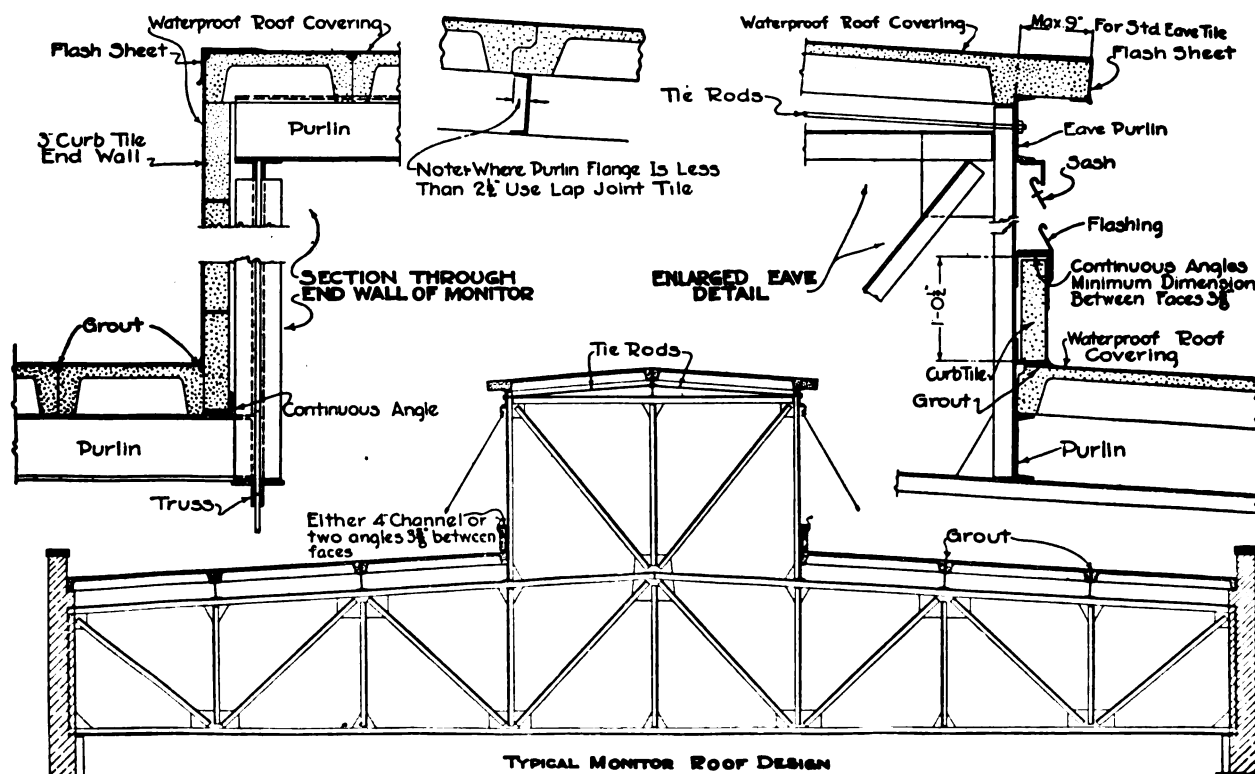
In no case shall the stress in the cables exceed 20,000 lbs. per sq. in., or more than 20% of the ultimate strength. The spacing of these cables and the depths of slabs have to conform to the standards of the UNITED STATES GYPSUM COMPANY.

The gypsum composition for making the slabs shall consist of a uniform mixture of Pyrofill and water. The top surface of this slab shall be screeded smooth so as to leave an even surface to receive the roof covering.

All cantilever construction, such as eaves, etc., shall be cast solid of Structolite, properly reinforced and anchored to the adjoining slab. All curb walls, ends of monitors, etc., shall be constructed of 3-in. Pyrobar Gypsum Tile, neatly laid up in gypsum mortar, joints to be well bedded and struck.

The steel contractor shall provide proper steel framing around all openings such as vent stacks, ventilators, etc.

For further information and designing details on Pyrofill Monolithic construction, send for folder PM-1.



CONSTRUCTION DETAILS SHOWING TYPICAL DESIGNS OF PYROBAR ROOF TILE

PORETE MANUFACTURING CO.

Manufacturers of Lightweight Concrete Products

TELEPHONE
BRANCH BROOK 6700

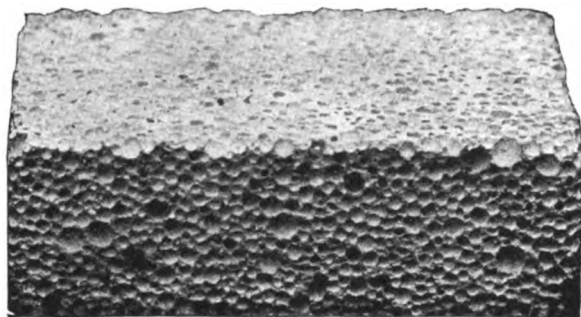
26 Verona Avenue
NEWARK, N. J.

Product

PORETE (LIGHTWEIGHT CONCRETE).

What Porete Is

Porete is Portland cement concrete blown up with air and weighs only about one-third as much as solid concrete. Its strength is not affected by water or steam and improves with age. It has the light weight of wood and can be nailed like wood. On account of its air cell structure, it is a good heat and sound insulator. Porete is a better fire resisting material than solid concrete because of its low heat conductivity. Its permanency is equivalent to that of concrete.



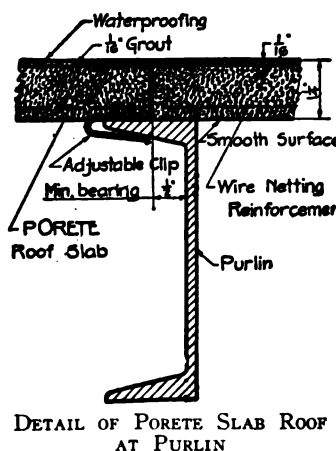
FULL SIZE STRUCTURE OF PORETE

Fireproof Roof Decks

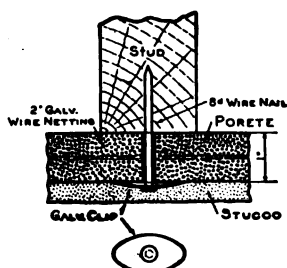
On account of its light weight, Porete is an ideal material for fireproof roofs. Porete roofing slabs, 24x32x1 $\frac{3}{8}$ in. thick, are smooth on the lower side and rough on the upper. They are reinforced with wire netting which is well protected with cement to prevent corrosion.

The slabs are fastened with galvanized clips to steel purlins (usually channels or pressed steel joists) set at 32-in. centers. After all the slabs are laid, a thin cement grout is brushed over the surface and this roof deck is then ready for the waterproofing which is ordinarily a tar and felt roof. Slate and tile can be applied to Porete roofs.

Advantages—Porete roofs can be adapted to any roof design, flat or slanting. They are easily erected in winter as well as in summer. They weigh only 7 lbs.



DETAIL OF PORETE SLAB ROOF AT PURLIN



DETAIL OF PORETE SLAB USED AS STUCCO SHEATHING

Slab is nailed direct to stud with an 8d nail and a galvanized washer. Note that galvanized wire netting in the Porete slab is protected with cement so that it can not rust

per sq. ft., which is one-half as much as other fireproof roofs. The single slabs weigh 30 lbs., which can be handled by one man. A Porete roof will carry a live load of 50 lbs. per sq. ft. with a factor of safety of 6. Buildings covered with Porete will be easier to heat because Porete is a good heat insulating material. Porete makes a permanent concrete roof which costs less because no false work, placing of steel bars, and no plastering from underneath are required. They present a clean, smooth stone finish on the underside. Due to their light weight, there is usually a decided saving in the steel of the supporting trusses.

Service—Our Engineering and Estimating Departments are at the service of engineers and architects. The erection of Porete roof decks is done by the PORETE MANUFACTURING Co.'s experienced force or can be done by the local contractor.

Floors

Porete flooring slabs, 24x32x1 $\frac{3}{8}$ in. thick, are nailed to wooden beams or to pressed steel joists, or they are fastened to channels or angle irons on 16- or 32-in. centers. After the slabs are all applied with the smooth face down, a $\frac{1}{4}$ - to $\frac{1}{2}$ -in. cement coat is applied or tile can be put into a cement grout on top of them.

Such a floor is good for 75 lbs. live load, per sq. ft., with beams on 32-in. centers, and 220 lbs. per sq ft. live load with beams on 16-in. centers.

These floors are used for walkways, galleries, platforms, covering of pipe trenches, elevator cars, charging floors, or wherever a light, fireproof floor is required.

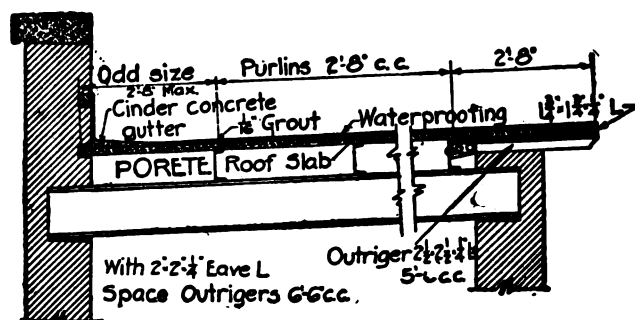
If applied to wooden beams, Porete floors make a good base for tile or cement finish in bathrooms, lobbies of apartments, hotels and dwellings, store floors, garages.

Various Applications of Porete Siding Slabs

Porete siding slabs, 24x32x1 in., are used as a base for stucco walls on wood framing for the building of stucco dwelling houses. They save the sheathing boards, lath and one coat of stucco and make a better wall because there is no lath to deteriorate.

They are also used for furring brick and concrete walls, for thin partitions and for fireproofing wooden structures.

Ask for special publications on roofs, floors, walls or partitions.



DETAIL OF FLAT ROOF; PARAPET AND OVERHANG

AMERICAN CEMENT TILE MFG. CO.

Manufacturers of Cement Tile Roofing

Oliver Building
PITTSBURGH, PA.

BRANCH OFFICES

NEW YORK, N. Y., 50 Church Street

PHILADELPHIA, PA., 815 Commercial Trust Building

BIRMINGHAM, ALA., 2700 North 23rd Street

WORKS: WAMPUM, PA.; LINCOLN, N. J.; BIRMINGHAM, ALA.

Products

Manufacturers of AMERICAN "CEMENTILE" REINFORCED CEMENT TILE ROOFING; INTERLOCKING "CEMENTILE"; FLAT "CEMENTILE"; CHANNEL "CEMENTILE."



TRADE-MARK

shown by tests at Columbia University, is 350 lbs. per sq. ft.

This product has been approved for general use as fireproof roofing material as required by Section 94 of the Building Code, City of New York.

Services

This company, since its incorporation in 1901, has specialized in the design, construction and erection of reinforced cement tile roofs for industrial buildings, garages, theaters, school buildings, etc. The growth and development during that time has brought American roofs to their present high degree of perfection. Our technical forces solicit further inquiries for specific data.

Design—The AMERICAN CEMENT TILE MFG. CO. maintains an Engineering Department, the services of which are available to its clientele without charge. Engineers and others will find that the co-operation of this department will prove of great economic value in the development of their plans and it is requested that inquiries be made and recommendations asked for at the earliest possible stage of the contemplated work. This department prefers to design the roof construction where the products of the company are installed; it is especially desirable that it be consulted to avoid the frequent complications that arise, particularly in the solution of unusual problems.

Estimates—Approximate estimates as well as definite proposals will be furnished on request. Where approximate estimates are desired, as much information as possible should accompany the request.

Installation—The erection of the products of the AMERICAN CEMENT TILE MFG. CO. is performed only by the erection crews maintained by the company itself; the use of experienced and efficient erectors is of the utmost importance to satisfactory results.

Guarantee—All materials and workmanship are unqualifiedly guaranteed.

American "Cementile" Roofing

A roof covering, the units of which are large reinforced cement tile of pleasing architectural shape and with a permanent red outer surface. They are produced in two distinct types, each of which is designed for specific requirements and manufactured by this company's particular process that combines clean sharp sand and portland cement, accurately reinforced, in a dense, hard dependable mass, impervious to water and proof against the elements.

Strength—American "Cementile" is accurately reinforced with metal, so placed as to secure the most positive results. The average breaking down load,

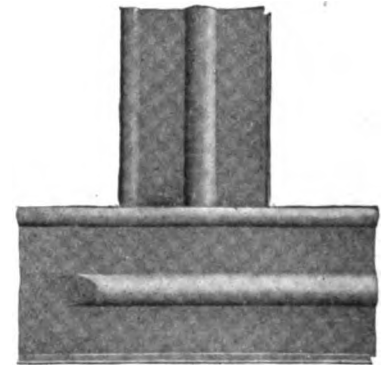
Application—The tile is placed directly over steel purlins—no roof boarding, wood sheathing, nailing strips, or other fastenings are required or used.

The construction required for either a pitched or flat roof is simply an economical superstructure of standard structural shapes properly designed to support the total roof load. The tiles are laid directly over open purlins spaced to accommodate the roofing units. The tile for a pitched roof overlap and interlock in the formation of the completed roofing unit, thus providing an expansion joint at every side and cross connection of the individual tile.

Interlocking "Cementile" (Plates 1, 2, 3)

Designed for pitched roofs, forming in itself a finished watertight roof.

Made 26 in. wide, 52 in. long and 1 in. thick with a roll along one edge and a rabbet on the opposite edge. When placed on the roof, the roll interlocks with the rabbet on the next tile, and with the addition of elastic rubber cement, forms watertight joints. The cross joints are formed by capping and staggering each row of tile over the next lower



INTERLOCKING "CEMENTILE"

row about 4 in., these joints also being pointed with elastic cement. The tile are held in place by means of an offset at the top, extending the full width of the tile. The exposed surface is finished with a pleasing brick-red finish while the underside has a smooth white finish, obtained by our own patent process.

DIMENSIONS AND WEIGHTS

Size of tile.....	26x52 in.
Thickness of tile.....	1 in.
Surface exposed to weather.....	24x48 in.
Number of tile per square of roof (100 sq. ft.).....	12½
Weight of single tile.....	128 lbs.
Weight per square of roof.....	1600 lbs.
Weight per sq. ft.....	16 lbs.
Guaranteed to carry a uniformly distributed load of 200 lbs. per sq. ft. over a 4-ft.-span.	

Roof Design—The minimum pitch desirable for slope of roof is one-sixth pitch, which is 4 in. to 1 ft.

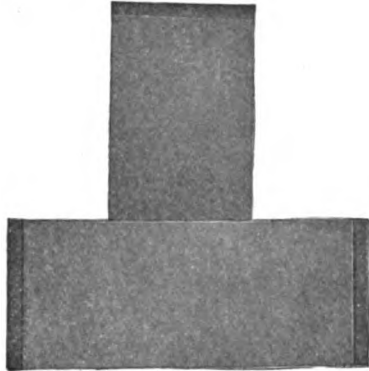
In laying out spacing for spans, always start at the eaves. After determining the eave space, use standard spacing of 3 ft. 10 in. to 4 ft. 1/2 in., placing short course, if any, at the ridge. The short courses at the ridge can be varied from 1 ft. 4 in. to 3 ft. 8 in. To eliminate courses shorter than 1 ft. 4 in., use special 60-in. tile for eave course and adjacent course if necessary.

The roof purlins should in all cases be steel channels or I-beams, held in alignment by the rods.

Glass Insert Tile—To provide light, glass insert tile are always desirable (Plate No. 1). These interlock with standard length tile and can be placed wherever required.

Flat "Cementile" (Plate No. 3)

Designed for flat or pitched construction. Requires the application of some standard composition roof covering to make watertight. Slabs are 1 1/2 in. thick by 24 in. wide by 60 in. long for purlin spacing of 5 ft. The ends are laid directly on flange of I-beam purlins, after which the joints are pointed with elastic cement and the entire roof covered with some form of composition roofing.



FLAT "CEMENTILE"

DIMENSIONS AND WEIGHTS

Thickness of the tile	1 1/2 in.
Size of standard tile	24x60 in.
Surface exposed	24x60 in.
Weight per sq. ft.	17 lbs.
Weight per square of roof	1700 lbs.

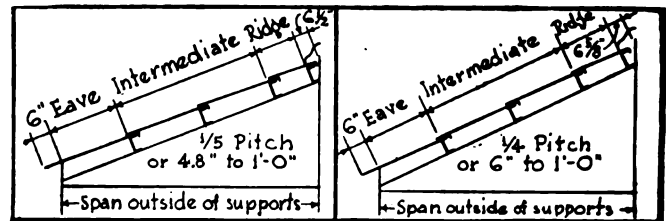
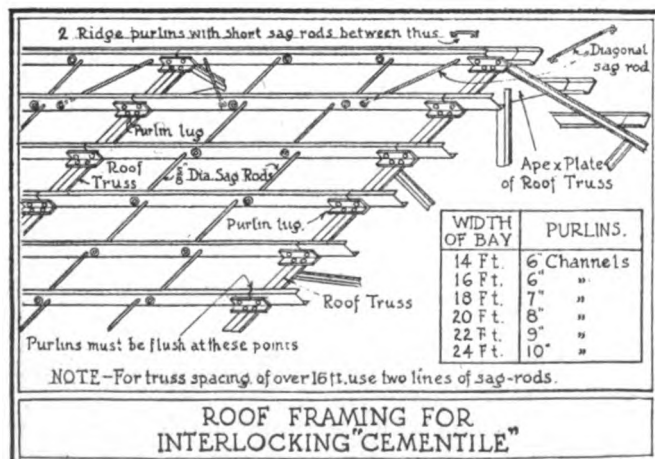
Guaranteed to carry a uniformly distributed load of 150 lbs. per square foot over a span of 5 ft.

Special tile is furnished for spaces over or under 60 in. and for flashing.

Roof Design—Flat tile is laid on I-beam purlins spaced 5 ft. center to center. Channels of equivalent strength having a flange width of not less than 2 1/2 in. may be used. After tile is laid the joints are thoroughly pointed.

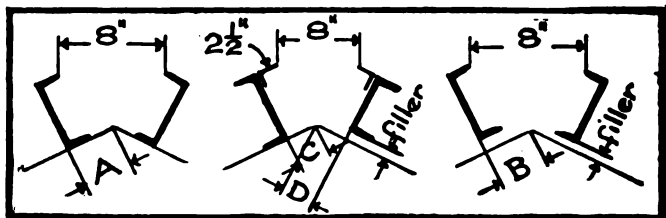
Channel "Cementile"

Also manufactured by this company. For details, see Plate No. 3. Further information and data will be furnished on request.



SPACING OF PURLINS

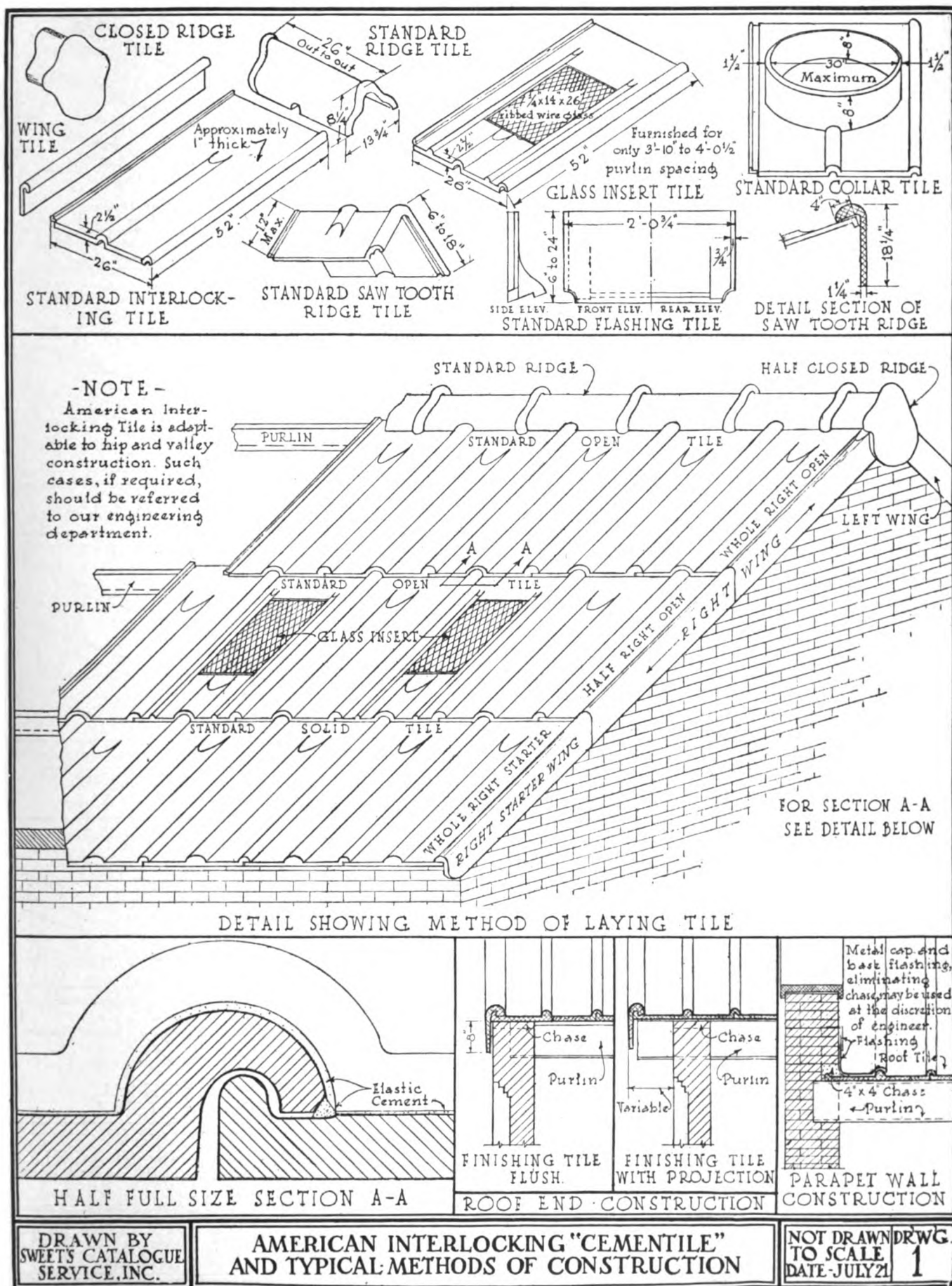
Span	1/5 Pitch			1/4 Pitch		
	Eave	Intermediate	Ridge	Eave	Intermediate	Ridge
35'	3'-7"	3 @ 4'-0 1/4"	2'-8"	3'-7"	3 @ 4'-0 1/4"	3'-4 1/2"
36'	3'-7"	3 @ 3'-11 3/4"	3'-4"	3'-7"	3 @ 4'-0"	3'-11 1/2"
37'	3'-7"	3 @ 3'-11 3/8"	3'-11 1/8"	4'-3"	3 @ 3'-11 3/8"	3'-11 3/8"
38'	3'-11"	3 @ 4'-0"	4'-0"	4'-3"	1 @ 4'-8 1/4"	3 @ 3'-11"
39'	4'-3"	1 @ 4'-4 1/4"	3 @ 3'-11 3/8"	3'-7"	4 @ 4'-0"	1'-8"
40'	4'-3"	1 @ 4'-8 3/8"	3 @ 4'-0 1/4"	3'-7"	4 @ 3'-11 3/8"	2'-3 3/8"
41'	3'-7"	4 @ 4'-0"	1'-11 1/2"	3'-7"	4 @ 4'-0 1/4"	2'-8 1/2"
42'	3'-7"	4 @ 3'-11 1/2"	2'-8"	3'-7"	4 @ 4'-0"	3'-4 1/2"
43'	3'-7"	4 @ 4'-0"	3'-0 1/2"	3'-7"	4 @ 3'-11 3/8"	3'-11 3/8"
44'	3'-7"	4 @ 3'-11"	3'-11"	4'-3"	4 @ 3'-11 3/8"	3'-11 3/8"
45'	3'-7"	4 @ 4'-0 1/4"	4'-0 1/4"	4'-3"	1 @ 4'-4 1/4"	4 @ 4'-0"
46'	3'-7"	4 @ 4'-0"	4'-0"	3'-7"	5 @ 3'-11 3/8"	1'-7 3/8"
47'	4'-3"	1 @ 4'-4 1/4"	4 @ 4'-0 1/2"	3'-7"	5 @ 3'-11 3/8"	2'-4 1/4"
48'	3'-7"	5 @ 4'-0 1/4"	1'-8 1/8"	3'-7"	5 @ 4'-0 1/4"	2'-8 1/8"
49'	3'-7"	5 @ 4'-0"	2'-3 3/4"	3'-7"	5 @ 3'-11 3/8"	3'-3 3/4"
50'	3'-7"	5 @ 4'-0 1/4"	2'-8 1/2"	3'-7"	5 @ 3'-11 3/8"	3'-11 3/8"
51'	3'-7"	5 @ 4'-0"	3'-4 1/4"	3'-11"	5 @ 4'-0 1/4"	4'-0 1/4"
52'	3'-7"	5 @ 3'-11 1/4"	3'-11 1/4"	4'-3"	1 @ 4'-4"	5 @ 3'-11 1/4"
53'	3'-11"	5 @ 4'-0 1/8"	4'-0 1/8"	3'-7"	6 @ 3'-11 1/4"	1'-7 3/8"
54'	4'-3"	1 @ 4'-3 3/4"	5 @ 4'-0"	3'-7"	6 @ 4'-0 1/8"	2'-0 1/8"
55'	3'-7"	6 @ 3'-11 1/8"	1'-8"	3'-7"	6 @ 4'-0"	2'-7 3/8"
56'	3'-7"	6 @ 4'-0"	2'-0 1/2"	3'-7"	6 @ 3'-11 1/4"	3'-3 3/8"
57'	3'-7"	6 @ 3'-11 3/8"	2'-7 3/4"	3'-7"	6 @ 4'-0 1/8"	3'-8"
58'	3'-7"	6 @ 4'-0 1/4"	3'-0"	3'-11"	6 @ 3'-11 1/8"	3'-11 1/8"
59'	3'-7"	6 @ 4'-0"	3'-8"	4'-3"	6 @ 4'-0 1/8"	4'-0 1/8"
60'	3'-11"	6 @ 3'-11 3/8"	3'-11 3/8"	3'-7"	7 @ 3'-11 1/8"	1'-7 1/8"
61'	4'-3"	6 @ 4'-0 1/8"	4'-0 1/8"	3'-7"	7 @ 4'-0"	1'-11 1/2"
62'	4'-3"	1 @ 4'-8"	6 @ 3'-11 1/8"	3'-7"	7 @ 3'-11 1/4"	2'-8"
63'	3'-7"	7 @ 3'-11 1/2"	1'-11 1/2"	3'-7"	7 @ 4'-0 1/8"	3'-0 1/8"
64'	3'-7"	7 @ 4'-0"	2'-4 1/4"	3'-7"	7 @ 4'-0"	3'-7 3/8"
65'	3'-7"	7 @ 3'-11 3/8"	2'-11 3/8"	3'-7"	7 @ 4'-0 1/4"	4'-0 1/4"
66'	3'-7"	7 @ 4'-0 1/4"	3'-4"	4'-3"	7 @ 4'-0 1/8"	4'-0 1/8"
67'	3'-7"	7 @ 4'-0"	3'-11 3/8"	4'-3"	1 @ 4'-7 3/8"	7 @ 4'-0"
68'	4'-3"	1 @ 4'-4 1/4"	3'-0 1/2"	3'-7"	8 @ 3'-11 3/8"	1'-11 3/8"
69'	4'-3"	1 @ 4'-8 1/4"	3'-11 3/8"	3'-7"	8 @ 4'-0 1/8"	2'-4 1/4"
70'	3'-7"	8 @ 3'-11 3/8"	1'-8"	3'-7"	8 @ 4'-0"	3'-0"
71'	3'-7"	8 @ 4'-0 1/8"	2'-0"	3'-7"	8 @ 3'-11 3/8"	3'-7 3/8"
72'	3'-7"	8 @ 4'-0"	2'-8"	3'-7"	8 @ 4'-0 1/8"	3'-11 3/8"
73'	3'-7"	8 @ 3'-11 3/8"	3'-3 1/2"	4'-3"	8 @ 4'-0"	4'-0 1/8"
74'	3'-7"	8 @ 4'-0 1/8"	3'-8"	4'-3"	1 @ 4'-7 3/8"	8 @ 3'-11 3/8"
75'	3'-11"	8 @ 4'-0"	3'-11 3/8"	3'-7"	9 @ 4'-0 1/8"	1'-8 3/8"

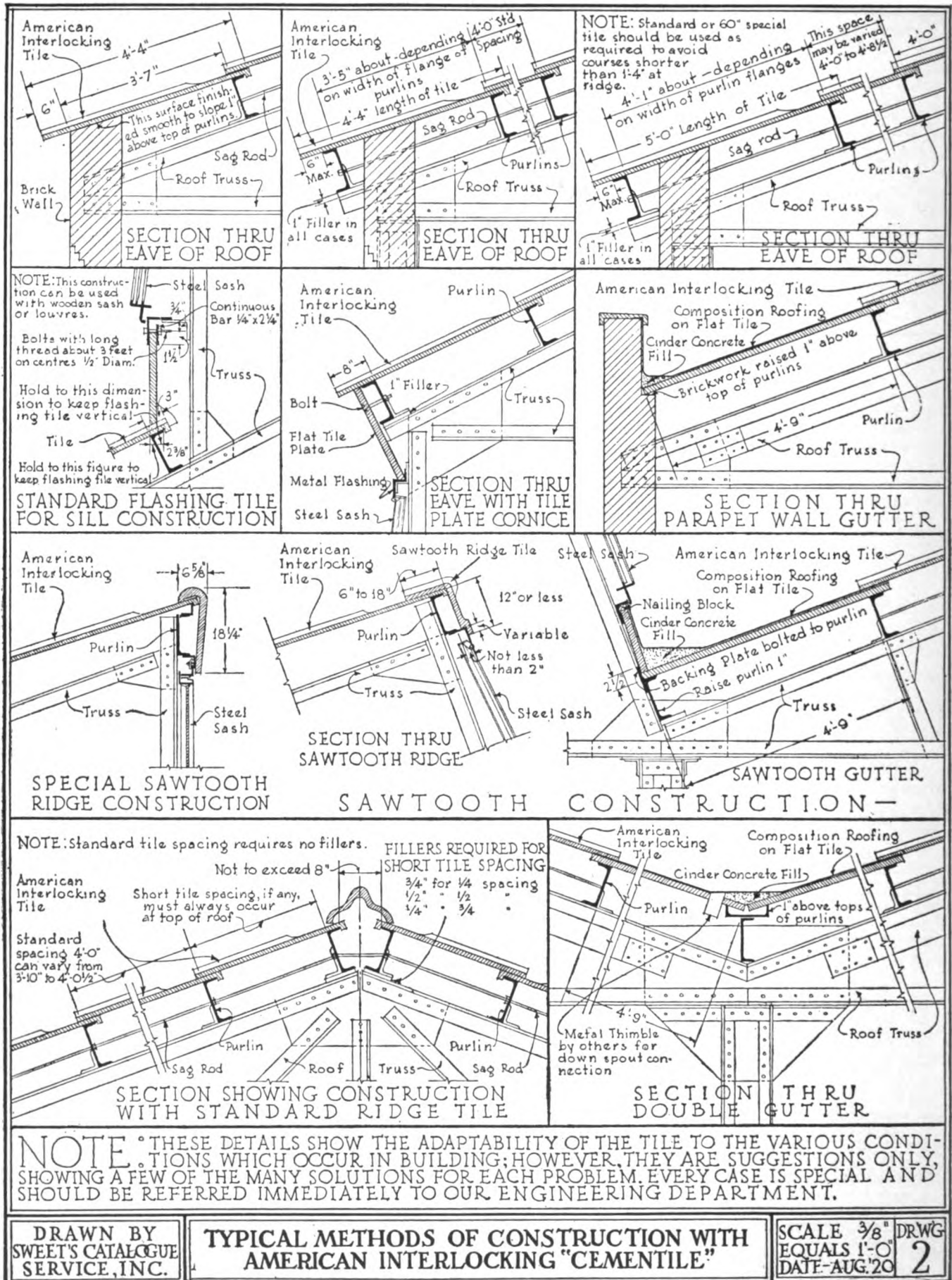


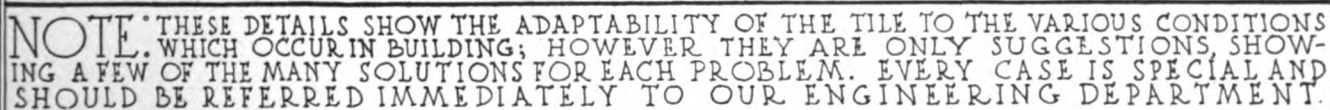
SPACING OF PURLINS AT RIDGE

	Channel size, in.	A, in.	Flange width, in.	Distance B with fillers		
				1/4 in.	1/2 in.	3/4 in.
1/6 pitch 4" in 12"	5	4 1/4	1.75	4 1/4	4 1/4	4
	6	4 3/8	1.92	4 3/8	4 3/8	3 7/8
	7	3 3/4	2.09	3 3/4	3 3/4	3 1/2
	8	3 3/4	2.26	3 1/4	3 1/4	3 1/4
	10	3 1/2	2.43	3 1/2	3 1/2	3 1/4
1/5 pitch 4 1/2" in 12"	5	4 1/4	1.75	3 1/4	3 1/4	3 3/8
	6	3 3/8	1.92	3 1/4	3 3/8	3 3/8
	7	3 3/8	2.09	3 1/4	3 3/8	3 3/8
	8	3 3/8	2.26	3 1/4	3 1/4	3 1/4
	10	2 7/8	2.43	2 1/2	2 1/2	2 1/2
1/4.8 pitch 5" in 12"	5	4	1.75	3 3/4	3 3/4	3 1/2
	6	3 3/4	1.92	3 3/4	3 3/4	3 1/2
	7	3 3/4	2.09	3 3/4	3 3/4	3 1/2
	8	3 3/4	2.26	3 1/4	3 1/4	2 7/8
	10	*2 5/8	*2.43	*2 1/2	*2 1/2	*2 1/2
1/4 pitch 6" in 12"	5	3 1/4	1.75	3 1/4	3 1/4	3 1/4
	6	3 3/8	1.92	3 1/4	3 1/4	3
	7	3	2.09	2 3/4	2 3/4	2 3/4
	8	2 11/16	2.26	2 3/4	2 3/4	2 1/2
	10	*2 7/16	*2.43	*2 1/2	*2 1/2	*2
1/3 pitch 8" in 12"	5	3 1/4	1.75	3 1/4	2 3/4	2 1/4
	6	2 3/4	1.92	2 3/4	2 3/4	2 3/4
	7	2 3/8	2.09	*2 1/2	*2 1/2	*2 1/2
	8	*1 15/16	*2.26	*1 1/2	*1 1/2	*1 1/2
	10	*1 1/2	*2.43	*1 1/2	*1 1/2	*1 1/2

*for C & D.







SCALE $\frac{3}{32}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$ DR'WG
EQUALS 1'-0"
DATE JAN. 22 3

CONTINENTAL CEMENT TILE COMPANY

Manufacturers of Reinforced, Pre-cast Cement Tile Roofing

TELEPHONE
FRANKLIN 4144, 4126

6 North Clark Street
CHICAGO, ILL.

WORKS
BLUE ISLAND, ILL.

BRANCH OFFICES IN PRINCIPAL CITIES

Product

Manufacturers of CONTINENTAL PRE-CAST REINFORCED CEMENT TILE ROOFING; STANDARD PITCHED TILE; FLAT SLABS; CHANNEL SLABS and TRIMMINGS.

Also manufacturers of Continental Glass Tile.

Services

The CONTINENTAL CEMENT TILE COMPANY manufactures and erects cement tile roofs for all types of industrial buildings, theatres, auditoriums, schools, railroad terminals, etc. This Company maintains a corps of competent engineers, whose services are, without obligation, at the disposal of engineers and architects. It will, upon receipt of blueprints and specifications, prepare approximate estimates or definite proposals for furnishing and erecting Continental cement tile roofs. When making a request for estimates, please give all of the information possible concerning the character and nature of the work to be figured on.

Plant

The plant of the CONTINENTAL CEMENT TILE COMPANY is fully equipped with the most modern machinery for the production of a uniformly high grade product.

Endurance

Endurance is assured by our production of slabs of great strength and density by skilled workmen, under rigid supervision and by the use of only such of the highest grade of raw materials as have successfully passed our exacting routine tests. The breaking load of Continental cement tile is many times that specified in any building ordinance.

These tile form the lightest permanent fireproof roof obtainable.

Economy

Economy is effected by the use of Continental cement tile due to its moderate first cost, by the complete absence of any maintenance expense (see our guarantee), and by its light weight which permits the use of light structural sections without sacrificing rigidity.

Appearance

The rich red color and attractive design of Continental pitched tile create an architectural feature worthy of place in the highest types of construction. This type of tile is laid directly on the steel purlins and requires no composition or prepared covering. It is exposed directly to the weather.

An excellent appearance is obtained in the flat and channel slabs by eliminating form marks and by their light, clean, uniform undersurfaces, which reflect a maximum amount of light and which do not require painting of the exposed interior surface.

Composition and Reinforcement

These tile are manufactured from highest grade portland cement and sand, and are reinforced to carry



TRADE-MARK

a load many times greater than that required by any building code. They are practically indestructible and offer unyielding resistance to the hardest wear and tear to which roofs are subjected.

Continental Flat Tile Slabs

For roofs of slight pitch, flat slabs are laid directly on steel purlins, expansion joints taking care of contraction and expansion. Five-foot centering is the standard purlin spacing. The standard size is 5x2 ft. x 1 $\frac{5}{8}$ in. and weighs 18 lbs. per

sq. ft. These tile are made in lengths ranging from 5 to 6 ft.

Continental Pitched Tile

Continental cement tile for pitched roofs do away with the necessity of applying any composition or prepared covering as they lie directly exposed to the weather and form a roof of excellent appearance on the exterior and interior. The outer color is a permanent rich red.

The standard purlin spacing required is 4 ft. on centers. Each tile is 52x23 $\frac{3}{8}$ in. The tile interlock, are self-adjusting and require no sheathing or fastening. All joints are hermetically sealed with elastic cement. Special lengths are furnished where odd spacings are unavoidable.

Ridge coping and finishing tile for gable ends are also made.

Continental Channel Slab

Where long spans are required between purlins, channel slabs are recommended. Purlins may often be dispensed with, the slabs being laid directly on the trusses or rafters spaced 6 to 10 ft. on centers.

These slabs are made in lengths ranging from 6 to 10 ft. x 18 in. wide, and weigh 21 lbs. per sq. ft. Standard stock lengths are 8 and 10 ft.

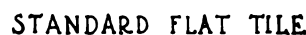
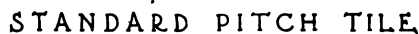
Typical Continental Cement Tile Roofing Installations

INDUSTRIAL BUILDINGS

Corn Products Refining Co., North Kansas City, Mo.—Entire new plant, roofs for twenty buildings
Santa Fe Railroad, Topeka, Kans.—Machinshop
American Steel Foundries, Alliance, Ohio
Railway Steel Springs Co., Chicago Heights, Ill., Hughes-Folkrod Company, Engineers and Constructors
Universal Portland Cement Co., Buffington, Ind.
Ruggles & Rademaker, Manistee, Mich.—Salt Plant
Niagara Radiator & Boiler Co., Chicago, Ill.
Hinde-Dauche Paper Co., Ft. Madison, Iowa, The H. K. Ferguson Co., Engineers and Architects
National Supply Co., Toledo, Ohio, Mills, Rhines, Bellman & Nordhoff, Engineers
Marquette Cement Co., La Salle, Ill.
Burnside Steel Co., Chicago, Ill.
American Wire Fabrics Co., Blue Island, Ill.
American Coating Mills, Elkhart, Ind.

MISCELLANEOUS

Edgewater Beach Hotel, Chicago, Ill.—Terrace over garage; Marshall & Fox, Architects.
Selwyn & Harris Theatres, Chicago, Ill., C. Howard Crane, Architect
Fourteenth Church of Christ, Scientist, Chicago, Ill., N. Max Dunning, Architect



• DETAILS OF CONTINENTAL CEMENT TILE AND METHODS OF CONSTRUCTION •

FEDERAL CEMENT TILE COMPANY

Westminster Building
CHICAGO, ILL.

WORKS: HAMMOND, IND. AND DETROIT, MICH.

Products and Services

"FEDERAL" REINFORCED CEMENT SLABS for flat and pitched roofs.

Our sales department, together with the engineering department, will assist engineers in effecting the most economical distribution of structural steel for carrying "Federal" cement slabs.

"Federal" Reinforced Cement Slabs

Impervious to severest elements. Not affected by heat, cold, fire or water; strengthen with time. Laid directly on steel purlins, making a fireproof construction. All pitched tile joints interlock and overlap. Require no painting, repairing, or other maintenance. Where flat slabs and composition covering are used, the joints are butted.

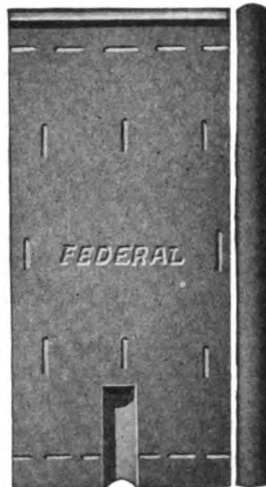
"FEDERAL" SLAB DATA FOR STANDARD PITCHED ROOFS

Covers 24x48 in.	Purlin spacing, 4 ft. 0 in.
Over-all length, 52 in.	Least allowable slope, $\frac{1}{8}$ pitch
12½ tile per square (100 sq. ft.)	Safe carrying load, 100 lbs. per sq. ft.
16 lbs. weight per sq. ft.	Breaking load, 300 lbs. per sq. ft.
Thickness, 1½ in.	
Wire reinforcement	

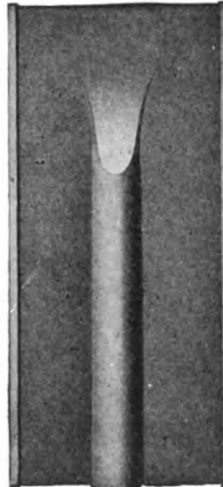
Cost

"Federal" slabs make the best and cheapest roof on the market, because they are indestructible and everlasting; no expense for maintenance; cut the rates if fire insurance is carried; save steel in the building frame; eliminate wood sheathing, also repairs and renewals.

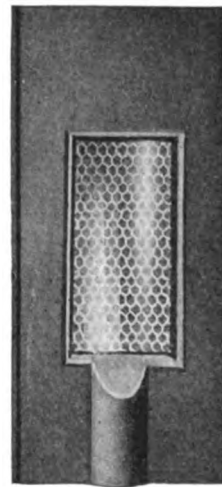
Joint Cap



Back



Front



SMALL GLASS SLAB
2 sq. ft. lighting area



LARGE GLASS SLAB
5 sq. ft. lighting area

"FEDERAL" INTERLOCKING SLAB



FACTORY WHERE "FEDERAL" REINFORCED SLABS ARE MADE

Two main buildings, each 100x600 ft. "Federal" slabs cover roofs, "Federal" glass slab light factories. Strictly fireproof; no fire insurance required or carried



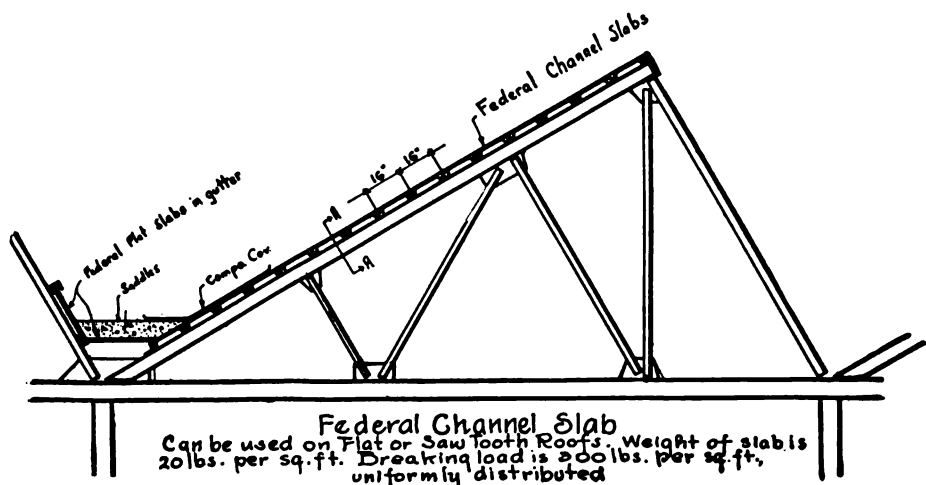
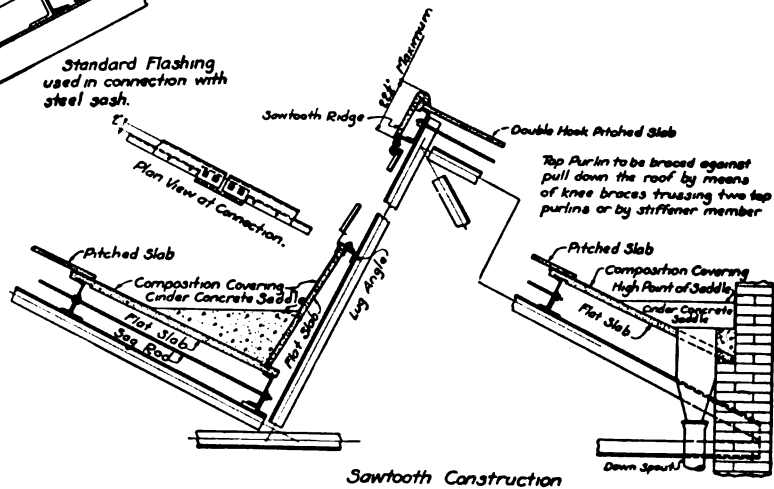
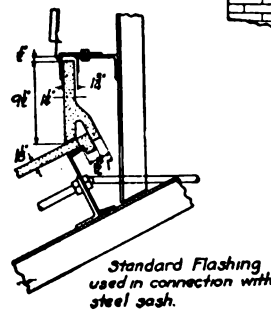
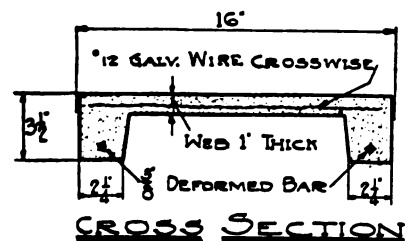
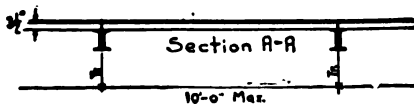
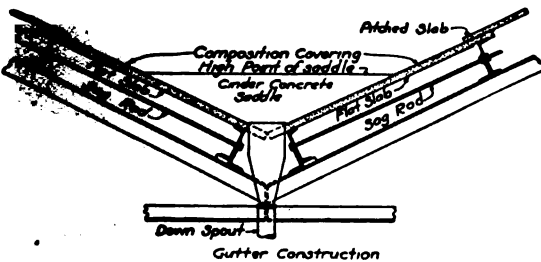
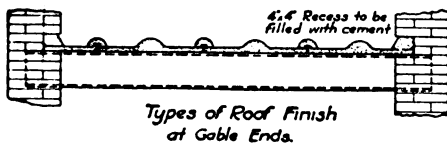
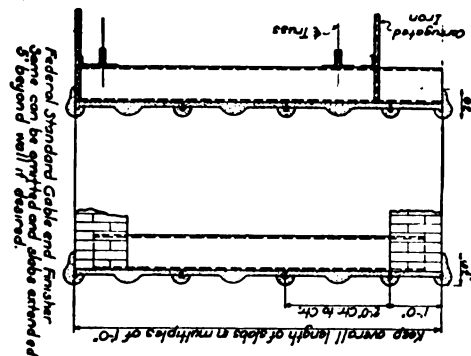
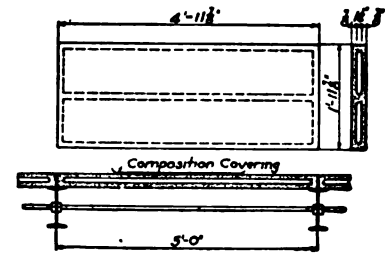
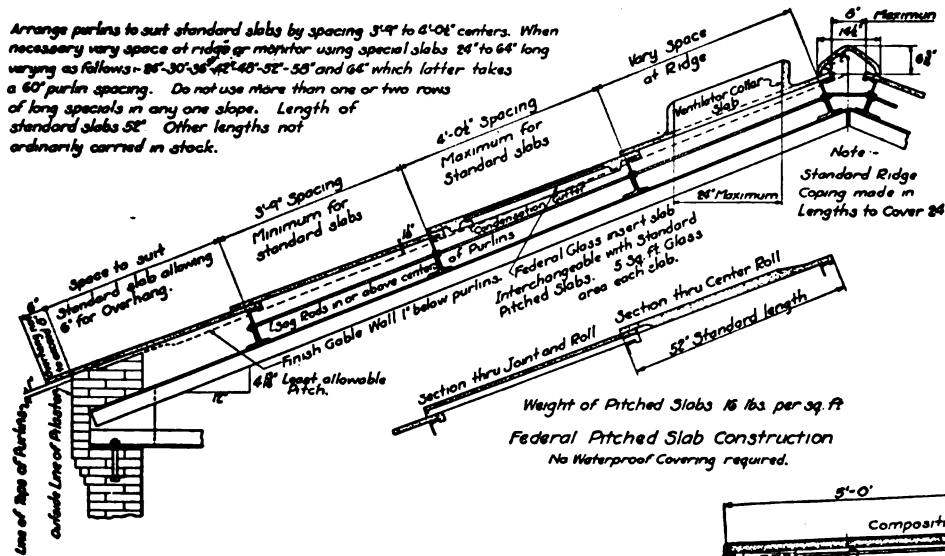
"FEDERAL" ALL-GLASS SLAB ROOF
Great Western Smelting and Refining Co., Chicago, Ill.

References

"Federal" slabs cover a large variety of structures, as shown by the following partial list of contracts:

United States Steel Corporation, 6 plants
International Harvester Co., 5 plants
Studebaker Corp., South Bend, Ind. and Detroit, Mich.
Crane Co., Chicago, Ill.
National Malleable Castings Co., Chicago, Ill.
American Steel Foundries Co., Indiana Harbor, Ind.; Granite City, Ill.; Alliance, Ohio
New Kansas City Station and Train Sheds
Illinois Central Railroad, Memphis, Tenn.
Pennsylvania Railroad, Chicago, Ill. and Indianapolis, Ind.
Ford Motor Co., Detroit and Dearborn, Mich.
General Motors, Flint and Detroit, Mich. and Janesville, Wis.
Willys-Overland Company, Toledo, Ohio
Maxwell Motor Co., Detroit, Mich.
Packard Motor Car Co., Detroit, Mich.
Texas Co., Texas City, Tex.
Gulf Refining Co., Port Arthur, Tex.
Standard Oil Co., Tulsa, Okla.
Pawling & Harnischfeger Co., Milwaukee, Wis.

Arrange purlins to suit standard slabs by spacing 3'-0" to 4'-0" centers. When necessary vary space at ridge or monitor using special slabs 24" to 64" long varying as follows: 24"-30"-36"-42"-48"-54"-60" and 64" which latter takes a 60" purlin spacing. Do not use more than one or two rows of long specials in any one slope. Length of standard slabs 52'. Other lengths not ordinarily carried in stock.



DETAILS OF FEDERAL ROOF CONSTRUCTION

THE AMERICAN ROLLING MILL CO.

Producers of Armco Ingot Iron

GENERAL OFFICES
MIDDLETOWN, OHIO

DISTRICT OFFICES

NEW YORK, N. Y., 50 Church Street
CHICAGO, ILL., People's Gas Building
PHILADELPHIA, PA., Widener Building
ST. LOUIS, MO., 1120 Liberty Central Trust Building

DETROIT, MICH., Dime Bank Building
PITTSBURGH, PA., Oliver Building
HOUSTON, TEX.,

CLEVELAND, OHIO, 819 Finance Building
CINCINNATI, OHIO, Union Trust Building
BUFFALO, N. Y., Niagara Life Building
SAN FRANCISCO, CAL., 10th and Bryant Streets

Products

"ARMCO" INGOT IRON Enameling, Blue Annealed, Galvanized, Black, Polished and Alloy Coated sheets and Special Finish sheets.

Also Automobile, Electric, Furniture, High Carbon and Alloy Coated Steel sheets.

STEEL CASTINGS.



accelerates corrosion through electrolytic action. By practically eliminating the impurities in the manufacture of ARMCO Ingot Iron, rust-resistance is assured.

ARMCO Ingot Iron is manufactured with such skill, intelligence and accuracy in each step that all of the above requirements are met.

Five Points of Superiority of Armco Ingot Iron

ARMCO Ingot Iron acceptably fulfills the demand on its five points of superiority—chemical purity, rust-resistance, enameling properties, welding properties and electrical conductivity—each a characteristic of tremendous importance to the diversified industries of America.

Chemical Purity—The raw materials entering into the manufacture of ARMCO Ingot Iron are especially selected.

The iron ore must be of the highest quality and a large part of it is taken from mines owned in part by the company.

In producing its own pig iron also, ARMCO scores another point for chemical purity by being able to reject and divert to the making of steel any pig iron which does not meet the extraordinarily high standard set for ingot iron.

Other raw materials entering into the open hearth furnace charge must be of an especially low sulphur, phosphorus, manganese and copper content, and every car of such materials is carefully checked in a control laboratory before it is allowed to enter the plant.

Analyses and check analyses taken at different stages in the process of manufacture, must prove the product to contain in the aggregate not more than 16/100% of not only the impurities usually considered in steel practice (i. e., silicon, sulphur, phosphorus, manganese and carbon), but also copper, and the gases oxygen, hydrogen and nitrogen.

Special deoxidizing agents are used to reduce the gaseous content to a minimum.

Any material not meeting the purity standard set is rejected. Therefore, uniformity and chemical purity are practically assured to the ultimate consumer.

Welding Property—The first essential of welding material is purity; the sulphur, phosphorus, manganese, carbon, silicon and gases should be as low as possible.

Prior to the World War, Swedish or Norway iron was principally used for welding. When the importation of these materials became impossible, it developed that ARMCO Ingot Iron welding rods met all requirements, not only equally as well, but in a wholly satisfactory manner.

Rust-resisting Property—"The Electrolytic Theory of Corrosion" holds that purity, homogeneity, denseness and uniformity are necessary to combat rapid deterioration.

It is well known that the segregation of impurities

Electrical Conductivity—ARMCO Ingot Iron, because of its high purity, even density and degasification, is a good conductor of electricity. It holds first place among ferrous metals and is used extensively for telephone and telegraph wire. Compared to the annealed copper standard which is taken at 100%, ARMCO Ingot Iron has a conductivity of 18%, or an electrical resistance approximately five and one-half times that of copper. Mild steel has a conductivity of 12%, or an electrical resistance of from eight to nine times that of copper.

In the transmission of power, ARMCO Ingot Iron is adapted for use as a stranded wire cable for high tension lines across long spans, such as rivers, gulches, etc., wherever it is not practical to use copper wire.

The uniformity of ARMCO Ingot Iron in analysis, density, etc., is a guarantee of its unvarying conductivity.

Enameling Property—As a base for vitreous enameling, ARMCO Ingot Iron is unexcelled.

The enameling compound is fused on to the base metal at high temperatures, ranging from 1400° Fahr. to 2000° Fahr.

It is apparent that when metals with a high gas content are subjected to this high temperature, the gases will expand and cause eruptions, resulting in blisters.

The freedom of ARMCO Ingot Iron from these imprisoned gases eliminates this condition and reduces discard losses to a minimum.

Experience has proved also that ARMCO Ingot Iron warps less than other materials through the cooling process after enameling.

Armco Specialty Products

Automobile Steel Sheets and Pickled Specialties—ARMCO uses the same care in the manufacture of steel specialties as it does in the manufacture of pure iron. ARMCO-made automobile sheets are available in all grades to meet the diversified requirements and wishes of the trade. Each grade has received the careful attention of specialists who follow closely the trend of the time and quite frequently anticipate the demand of the automobile manufacturers in the production of material to meet the requirements of new design.

Furniture Steel Sheets—We can furnish furniture grades in either ingot iron or steel and in gauges from No. 10 to No. 24, inclusive. The most uniform material is available in standard sizes up to 36 in. wide. It is impossible to produce uniformly good surfaces in extreme widths or heavy gauges.

Alloy Coated Cold Rolled Sheets—Can be furnished in ingot iron or steel.

This product is used chiefly in the manufacture of metal caskets, gasoline tanks for automobiles, auto trucks and tractors and water tanks for tractor radiators.

Due to the treatment and care exercised in the manufacture of alloy coated sheets this material possesses excellent drawing qualities which can be varied to suit each individual requirement. Because of its composition, the alloy coating acts as a flux and causes the sheet to flow uniformly under the dies. The soft coating reduces friction and wear on the dies to a minimum.

Alloy coated sheets solder with extreme facility; they may be spot welded if desired, and can be copper plated or nickel plated. The alloy coating makes the sheet an ideal material to receive and hold paint.

Furnished in gauges No. 12 to No. 26, inclusive.

Sketch Plates—Sketch plates can be sheared to specifications provided dimensions are within our rolling limits.

Circles—Any of our regular grades can be furnished in circles within these limits:

Lightest—As light as produced on the mills.

Heaviest— $\frac{1}{4}$ in.

Smallest—10 in. diameter.

Largest—60 in. diameter.

Heavier sheets can be cut to circles on straight shears, but edges will be irregular.

Ingot Iron Enameling Stock—Ingot iron enameling stock is a pickled sheet; the surface while smooth and free from scale has been cold rolled only sufficiently to insure flatness.

Freedom from gases and impurities makes ingot iron enameling stock enamel without pinholes. The material is extremely soft and hot rolling of the sheets does not produce as glazed a finish on the soft iron as it does on steel. Ingot iron for this reason has a pronounced velvety surface which enables it to take a more uniform coat of enamel.

Ingot iron enameling stock can be depended on to produce a uniform and extremely large percentage of fine, enameled ware. Rejection percentage rarely exceeds 1% to 2%.

High Carbon Steel—We are prepared to furnish high carbon steel sheets containing .15% carbon or over, within the following limits:

No. 18 to No. 20 gauge, inclusive, in sizes not exceeding 36x120 in.

No. 21 to No. 23 gauge, inclusive, in sizes not exceeding 30x120 in.

No. 24 to No. 26 gauge, inclusive, in sizes not exceeding 36x96 in.

No. 17 gauge and heavier, up to rolling limits.

In addition to regular grades of high carbon steel, as required for road scrapers, shovels, putty knives, coal chutes, etc., we produce a special grade known as "section steel" for the manufacture of mowing ma-

chine knives; also special grades used in the making of automobile clutches, corn knives and saws.

Ingot Iron Blue Annealed Sheets—Blue Annealing removes rolling strains and heats the sheets sufficiently to permit of flattening in the roller leveller.

Blue annealed ingot iron is the best material to use where resistance to corrosion is a factor. Ingot iron resists rust and in addition has the best of working qualities. It is especially adapted to the manufacture of water and oil tanks, range boilers, gas containers, electrical switch boxes, grave vaults, etc.

Steel blue annealed sheets can also be furnished.

Ingot Iron Galvanized Sheets—Ingot iron galvanized sheets find their chief use where rust-resistance is essential. By repeated tests and experiments, it has been found that ingot iron dissolves much more slowly in molten zinc than does steel. This gives the sheet a pure coating of spelter which will withstand the action of the elements to a much greater degree than a coating with a higher iron content.

Ingot iron galvanized sheets are used extensively in the manufacture of culverts, flumes, washing machines, refrigerators, roofing, siding and formed factory products.

Ingot Iron Galvanized Sheets can be furnished in all gauges and sizes shown in the following table:

INGOT IRON GALVANIZED SHEET SIZES

Gauge No.	Width, in.									
	48	44	42	40	36	32	30	28	26	24
	Length, in.									
10	144	144	144	144	144	144	144	144	144	144
12	144	144	144	144	144	144	144	144	144	144
14	144	144	144	144	144	144	144	144	144	144
16	144	144	144	144	144	144	144	144	144	144
18	144	144	144	144	144	144	144	144	144	144
20	144	144	144	144	144	144	144	144	144	144
22	144	144	144	144	144	144	144	144	144	144
24			120	120	144	144	144	144	144	144
26				120	144	144	144	144	144	144
27				120	144	144	144	144	144	144
28					120	120	144	144	144	144

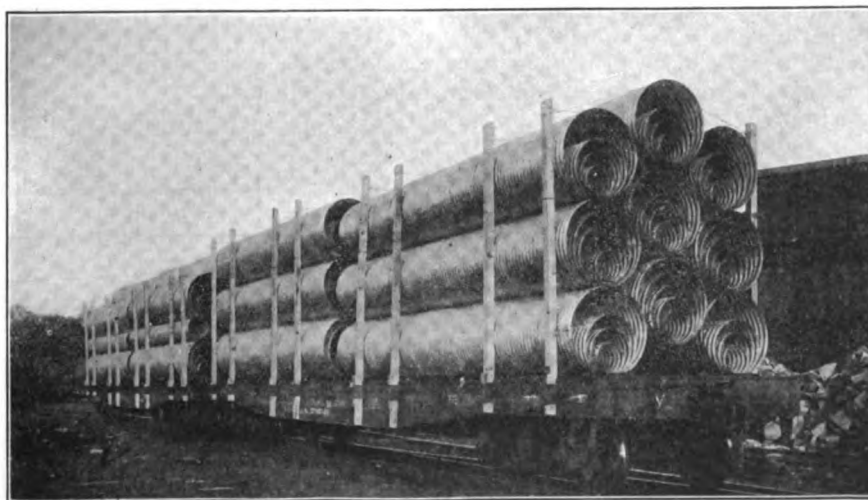
Steel Castings

The knowledge and skill attained by the Armco organization in the making of high quality steel sheets, together with excellent foundry and furnace facilities, make possible the production of high grade open-hearth steel castings. We are especially well prepared to furnish the following mill type castings up to 60 tons each:

Annealing covers, annealing bottoms, pinions, charging pans, anvil blocks, roll housings, spindles, coupling boxes, charging spoons, etc.

Our castings are manufactured of clean, dense steel and are very close to specified dimensions.

Pinions, spindles, etc., can be furnished completely machined.



A SHIPMENT OF CORRUGATED CULVERTS

THE AMERICAN ZINC PRODUCTS CO.

GENERAL OFFICES

GREENCASTLE, IND.

Products

"OLD CHATEAU" ROOFING and SIDING, furnished in Corrugated and V-crimped Sheets.

Also manufacturers of Zinc Ridge Roll, V-capping, Valley, Flashing, etc., made from pure zinc sheets; Zinc Sheets, all gauges and sizes; Zinc Tiles for residences and other high class buildings.

Zinc as a Roofing Material

More than a century ago the builders of Belgium and France realized the value of zinc sheets in weather exposed construction. Zinc roofs are now extant that were installed more than 100 years ago. Gutters, flashings, eavetroughs, valleys and conductor pipes were made of zinc and these articles are enduring far beyond the life of the masonry itself. In addition to this big saving in weather-wear the zinc sheets can still be salvaged and sold at a price near the original cost.

As a weather resister, zinc sheets stand pre-eminent among metals. Neither atmosphere or moisture has a perceptible effect upon it. From the moment a zinc sheet is placed in use, down to the day in another century when the other materials of the structure have crumbled or rotted away, it is still a sheet of zinc. The weather elements scarcely change it; it is still worth its weight in zinc.

"Old Chateau" Pure Zinc Roofing

An Everlasting Roofing at Moderate Cost—The American people have long looked for an inexpensive roofing material which could be used with assurance of long life, but until the war increased the production of zinc sheets in this country, they have looked in vain.

Copper could be secured, but its price was very high—in fact too high to permit of its use as a roofing material upon common buildings. Zinc was known to be everlasting, but in this country the production was so small (only two plants) that sheets could not be obtained for roofing purposes.

The war changed this condition as *zinc sheets had to be obtained* for powder box linings and many other war purposes. By reason of this war demand the facilities for the production of zinc sheets were materially increased and this company is now in a position to furnish "Old Chateau" zinc roofing in unlimited quantities at a price but little higher than galvanized (zinc coated) sheets.

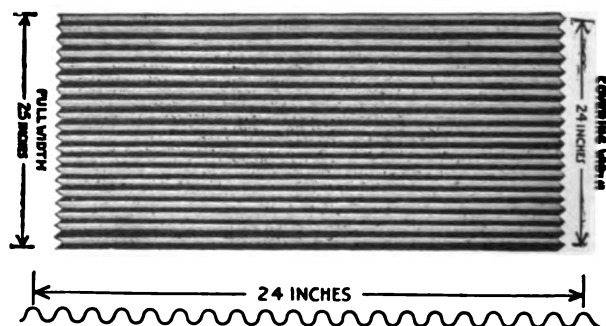
It has long been known how much better a galvanized (zinc coated) sheet was than an ordinary black steel sheet. The extra life was in the light zinc coating on each side of the steel sheet. At the present time about $\frac{1}{2}$ oz. of zinc is used upon each square foot of surface.

Some Outstanding Advantages—"Old Chateau" pure zinc roofing positively will not rust, requires no painting or upkeep, is not affected by smoke or sulphur fumes and is a permanent construction with large salvage value.

Old Chateau
ZINC ROOFING

One and One-quarter Inch Corrugated "Old Chateau" Zinc Roofing

Each sheet has twenty full corrugations, $1\frac{1}{4}$ in. from center to center. Full width, 24 in. when lapped one corrugation. All lengths.



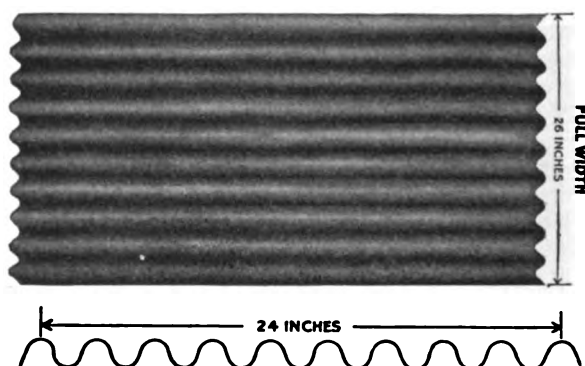
ONE AND ONE-QUARTER INCH CORRUGATED ZINC ROOFING

APPROXIMATE WEIGHTS PER SQUARE

Gauge No.	Weight, lbs.
9	76
10	84
11	101

Two and One-half Inch Corrugated "Old Chateau" Zinc Roofing, $\frac{5}{8}$ Inch Deep

Each sheet has ten full corrugations, $2\frac{1}{2}$ in. from center to center. Full width 26 in. both corrugations down. Covering width, 24 in. when lapped one corrugation. On special orders we furnish $2\frac{1}{2}$ -in. corrugated sheets $27\frac{1}{2}$ in. wide after forming, which will cover 24 in. after allowing one and one-half corrugations for side lap. All lengths.



TWO AND ONE-HALF INCH CORRUGATED ZINC ROOFING

APPROXIMATE WEIGHTS PER SQUARE

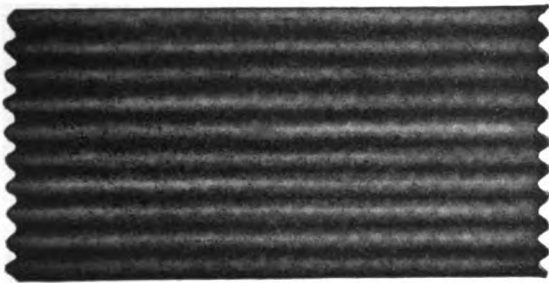
Gauge No.	Weight, lbs.
9	73
10	81
11	97
12	113
13	129
14	145
15	161
16	182

MAXIMUM PURLIN SPACING RECOMMENDED FOR "OLD CHATEAU" CORRUGATED ZINC SHEETS, $\frac{3}{8}$ -IN. DEEP

Gauge No.	Spacing, in.
9	18
10	24
11	33
12	42
13	48
14	52
15	60

Two and One-half Inch Corrugated Pure Zinc Roofing for Long Spans, Special $\frac{3}{8}$ Inch Deep

Each sheet lays 36 in. to the weather with one corrugation side lap. Saves about 6% on side laps over ordinary corrugated. More cheaply applied. A remarkably strong corrugated sheet. Deep corrugations afford complete protection against leaks. Can be furnished in any narrower width if desired. Any length not over 10 ft.



SPECIAL $\frac{3}{8}$ -IN. CORRUGATED ZINC ROOFING

APPROXIMATE WEIGHTS PER SQUARE

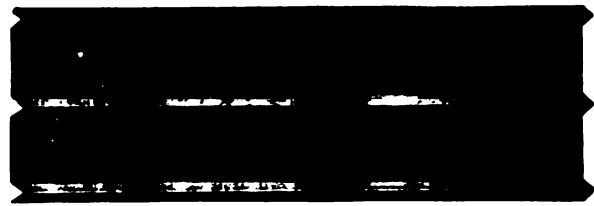
Gauge No.	Weight, lbs.
9	79
10	88
11	112
12	131
13	149
14	168
15	187

MAXIMUM PURLIN SPACING RECOMMENDED FOR "OLD CHATEAU" CORRUGATED ZINC SHEETS, SPECIAL $\frac{3}{8}$ -IN. DEEP

Gauge No.	Spacing, in.
9	30
10	40
11	48
12	58
13	66
14	72
15	78

Three V-crimp "Old Chateau" Zinc Roofing

Makes a better appearing roof than the two V-crimp; the center crimp stiffens the sheet and prevents rattling. 100 lin. ft. of sticks required with each square which is sufficient for all crimps; 50 lin. ft. is



THREE V-CRIMP ZINC ROOFING

APPROXIMATE WEIGHTS PER SQUARE

Gauge No.	Weight, lbs.
9	76
10	84
11	101

sufficient when sticks are not used under the center crimp. Wood sticks furnished only when ordered. All lengths.

Methods of Application

On Wood—(1) Cut pure zinc nails.

(2) Zinc coated barbed wire nails.

(3) Galvanized screws.

On Steel—(1) Zinc straps with tinned rivets and burrs.

(2) Structural clinch nails with lead washers (sometimes called sheet roofing fasteners).

(3) Aluminum wire.

(4) Zinc clips soldered to sheets.

Comparison of Gauges

Attention is called to the fact that the gauges of zinc are specified by different numbers than those applying on black or galvanized sheets. Below are shown the gauges of zinc and opposite these are given the nearest comparative gauges of steel.

Where a roof is covered with wooden sheathing, Nos. 9 and 10 gauges can safely be applied. If there is no wooden sheathing, the heavier gauges should be used.

A light gauge zinc will outlast any building on which it is placed, but the matter of roof support must be considered.

COMPARISON OF GAUGES

American Zinc Products Co. Zinc Gauges			United States Standard Steel Gauges	
No.	Lbs. per sq. ft.	Approx. thickness in.	No.	Approx. thickness in.
9	.675	.018	26	.0187
10	.750	.020 (1-50)	25	.0218
11	.900	.024	24	.0250
12	1.050	.028	23	.0281
13	1.200	.032	22	.0312
14	1.350	.036	21	.0343
15	1.500	.040 (1-25)	20	.0375

H. H. ROBERTSON COMPANY

Manufacturers of Robertson Process Metal and Asphalt Products
PITTSBURGH, PA.

FACTORIES: AMBRIDGE, PA.; WALTHAM, MASS.; SARNIA, ONT., CAN.

BRANCH OFFICES

BALTIMORE, MD.	CHICAGO, ILL.	NEW YORK, N. Y.	ATLANTA, GA.	INDIANAPOLIS, IND.	NEW ORLEANS, LA.
BIRMINGHAM, ALA.	CINCINNATI, OHIO	PHILADELPHIA, PA.	DAVENPORT, IOWA	KANSAS CITY, MO.	OMAHA, NEBR.
BOSTON, MASS.	CLEVELAND, OHIO	SAN FRANCISCO, CAL.	EASTON, PA.	MINNEAPOLIS, MINN.	PORTLAND, ORE.
BUFFALO, N. Y.	DENVER, COLO.	ALLENTOWN, PA.	HONOLULU, T. H.	NASHVILLE, TENN.	ST. LOUIS, MO.
SCRANTON, PA.		SEATTLE, WASH.		TULSA, OKLA.	

LONDON, E. C., ENGLAND, EDW. LE BAS & Co., Dock House, Billiter Street

FOR CANADA:

H. H. ROBERTSON Co., LTD., Sarnia, Toronto, Montreal, St. John, N. B., Halifax, N. S., Vancouver, Winnipeg, St. John's, N. F.

Products

ROBERTSON PROCESS METAL: Flat Corrugated, and Mansard Sheets and Bars for Roofing and Siding, Flashing, Ridge Caps, Louvers, Gutters, Down-spouts, Ventilators and Skylights.

Also manufacturers of Robertson Process Asphalt, Saturation Compounds, Insulation Compounds, Mineral Rubber, Battery Sealing Compounds.

Robertson Process Metal

A metal building material which is fully protected from the most severe weather conditions, smoke, gases, fumes, condensation and salt sea air, by means of three impervious coatings: (1) asphalt, (2) asbestos felt, (3) waterproofing. It is made in sheets and bars for use in industrial and commercial buildings on roofing, siding, down-spouts, gutters, general building trim, skylights and ventilators.

Robertson Process Metal represents real building economy from every standpoint. It is moderate in first cost, is easily erected and eliminates the necessity for repairs.

It withstands rust and corrosion and does not need frequent painting. It has all the *light weight, structural steel and foundation* cost-saving features of plain or galvanized sheets and at the same time is corrosion-proof. Its light weight insures a substantial reduction in freight charges. A square of R.P.M. weighs, on the average, only 200 lbs. The covering area of a ton of R.P.M. is far greater than any other building material of equal durability. An actual sample of Robertson Process Metal like that illustrated will gladly be sent on request.

Forms, Color and Sizes—Robertson Process Metal is made in a variety of standard forms and sizes which good practice has demonstrated to be the most useful, economical and attractive. It is made in flat, corrugated, and mansard roofing and siding sheets. It is also made in various forms for building purposes, such as ridge caps, down-spouts, gutters, flashing, louvers, etc. Robertson Process Metal forms an important part of Robertson Ventilators and Robertson Skylights.

Robertson Process Metal is supplied in black, red and aluminum finish. Sizes and weights will be given on application. All necessary materials needed in fastening—such as nails, rivets, hooks, straps, bolts, etc., can be supplied.



TRADE-MARK



ROBERTSON PROCESS METAL
Showing various protective coatings



ROBERTSON
PROCESS
METAL CORRUGATED SHEET

Advantages—Robertson Process Metal has stood every test on buildings in the service of railroads, chemical and fertilizer concerns, coal mines and the iron and steel industry, and is used and indorsed by engineers and architects throughout the country. The fact that it is immune to the corroding action of gases, acid and alkali fumes, all weather conditions, and salt sea air, makes it exceptionally well suited to building construction where protection against severe corrosion conditions is essential. Its low cost per year makes it attractive to all other industries as well.

Robertson Process Metal has insulating qualities that greatly reduce the tendency toward condensation of moisture. Buildings in which it is used are, therefore, drier, easier to heat in winter and remain cooler and more comfortable in summer.

The light weight, strength and permanency of Robertson Process Metal renders construction as a whole, less costly by comparison with other building material. Furthermore, first cost is the total cost. There is no upkeep, no repair; *painting* is unnecessary. It saves on *first cost and maintenance cost*.

Purlin and Girt Spacings—For corrugated sheets on roof structures having a rise of 4 in. or more in 12 in., purlins may be spaced as follows:

Thickness of metal, Gauge No.	26	24	22	20	18
Maximum span (c. to c.) ft.—in.	3'9"	4'9"	5'9"	6'6"	7'6"

Corrugated Robertson Process Metal sheets for siding, girts may be spaced as follows:

Thickness of metal, Gauge No.	26	24	22	20
Maximum span (c. to c.) ft.—in.	3'10"	4'10"	5'10"	6'8"

ROBERTSON PROCESS METAL, CORRUGATED OR MANSARD

Weight in lbs. per 100 sq. ft. of material area			For crated shipments add	
Gauge	Net		Domestic	Export
	Black	Maroon		
26	138	144	14	20
24	165	171	15	21
22	192	198	16	22
20	218	224	17	24

Well-known Users of Robertson Process Metal

This partial list of users is significant because of the prominence of the various corporations and because *all of them have used Robertson Process Metal repeatedly*. The date of the original order is shown after each name. The experience of such concerns, covering many years' usage, is evidence of the true value in this Robertson product.

COMPANY	ORDERS
American Car & Foundry Co. (1913)	7
American Locomotive Co. (1913)	13
Bethlehem Steel Co. (1910)	24
Crucible Steel Company of America (1913)	37
Davison Chemical Co. (1908)	70
E. I. du Pont de Nemours & Co., Inc. (1909)	29
Eastman Kodak Co. (1919)	16
General Chemical Co. (1909)	111
General Electric Co. (1915)	8
Jones & Laughlin Steel Co. (1913)	22
Pennsylvania Lines (1909)	94
Standard Oil Companies and Subsidiaries (1912)	100
United States Steel Corporation (1908)	272

Robertson Ventilator

This Robertson product is built completely of Robertson Process Metal, and will withstand the most severe gases, fumes, smoke, etc., from the inside and all weather conditions from the outside. It does not need painting or repairs.

In addition to exceptional durability the Robertson Ventilator possesses many superiorities in design and construction. It is a stationary, long barrel type of ventilator, designed to provide the greatest development of air current under all conditions. It does not rely upon mechanical adjustment or moving parts which are not permanently operative. It has no bearings, spiders, braces and other supporting parts to resist the free passage of air.



ROBERTSON PROCESS
METAL VENTILATOR

Note in the illustration the projecting wings (an exclusive Robertson feature) which catch the wind and direct it into the double air channels. A ventilator's efficiency is largely determined by its capacity to utilize outside air currents for the purpose of siphonage. No matter whether the wind strikes the Robertson Ventilator from above, below or any angle, the deflecting devices utilize it to produce the suction necessary to draw the air out of the building. The Robertson Ventilator operates at full capacity in a gale of wind or when there is scarcely a breath of air stirring. Furthermore the Robertson design eliminates all possibility of loss of efficiency through back draft.

Robertson Ventilators are made in a variety of sizes to meet all requirements. Complete details and estimating data sent on request.

Robertson Skylight Construction

Robertson engineers have developed skylight construction to a point of great efficiency. A glance at the following condensed description shows that provision has been made for the elimination of rust, corrosion, glass breakage through deflection, improper cushioning and separating—everything which might shorten the life and efficiency of skylights.

(A) **Standard Rolled Steel Tee, Angle or Channel Bar Beam**—Always initially stiff enough, regardless of span, to carry its load without deflection—which is the main cause of glass breakage.

(B) **Robertson Process Protective Coating**—Proof against acid, alkali, fumes and moisture. Preserves steel beam from corrosion and consequently loss of initial stiffness. Obviates expensive periodical painting.

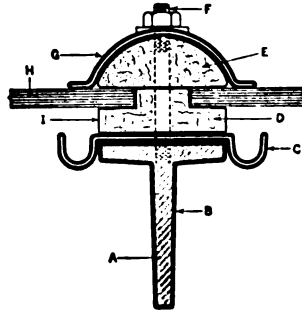


CADILLAC MOTOR COMPANY, DETROIT, MICH.

One of the buildings of the new Cadillac plant covered by 36,000 sq. ft. of Robertson Skylights. Altogether this Robertson Skylight installation amounts to 107,000 sq. ft.

SWEET'S CATALOGUE

(C) **Robertson Process Metal Condensation Gutter**—Not a part of the beam. Collects condensation from glass. Can not corrode. In sawtooth and continuous monitor sash, the condensation gutter illustrated, C, is usually omitted.



CROSS SECTION, ROBERTSON
PROCESS METAL SKYLIGHT
CONSTRUCTION

(D) **Asphaltic Glass Cushion and Separator**—Provides a non-absorbent, resilient, permanent and insulating bed for glass. Positively keeps glass from contact with hard substances, even the bolts, and gives it a broad and continuous bearing; hence preventing destructive strains. It is composed of very high grade asphalt.

(E) **Asphaltic Cap Filler**—Leaves no hollow spaces. Follows contour of glass surface, and adheres to it, hence absolutely excludes water. Made of same material as the cushion.

(F) **Cap Bolt and Nut**—Clamps the glass between flexible cushion and filler, insuring permanently waterproof joints. Supports cleaners' bridge planks without straining glass. Usually made of brass.

(G) **Robertson Process Metal Cap**—Protects filler and distributes pressure evenly and continuously. Spring tension locks the cap nuts. Of pleasing appearance and does not allow snow and dirt to lodge.

(H) **Glass**—As specified.

Finish—The bar, A, may be merely painted if desired.

Bar Lengths—Our experience shows that 6-ft. bar lengths give maximum value in glass area per dollar in either single or double pitch skylights. You save money by designing skylights of this size.

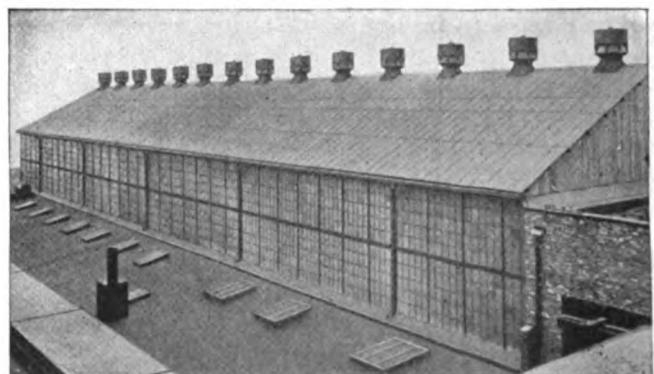
Versatility in Glazing Construction

Robertson glazing construction is pre-eminently suited to other uses besides skylights, such as monitor sash, sawtooth fronts, etc., both single and double glazed.

Widely used on all kinds of public, commercial and industrial buildings. Particularly adapted to extreme fume and moisture conditions. Gives maximum durability in chemical plants, foundries, silk and paper mills. Manufactured in a variety of shapes and sizes.

Bulletins

Interesting bulletins containing valuable engineering data and completely describing any of the Robertson Process products, together with an actual sample of Robertson Process Metal, will be sent on request.



KILBY MANUFACTURING COMPANY, CLEVELAND, OHIO

Completely protected by roofing, siding, ventilators, gutters and downspouts of Robertson Process Metal

PHILIP CAREY COMPANY

Manufacturers of Roofing

LOCKLAND, CINCINNATI, OHIO

FIFTY BRANCHES AND DISTRIBUTING POINTS IN NORTH AND SOUTH AMERICA AND EUROPE

FACTORIES: LOCKLAND, OHIO, AND PLYMOUTH MEETING, PA.

Products and Services

CAREY BUILT-UP ROOFING.

CAREY FELTS for Waterproofing, Weatherproofing and Roofing purposes.

CAREY ASPHALT PITCH.

Contracts taken to furnish and apply Carey Built-up Roofing in all locations.

For Waterproofing and Dampproofing Materials, see page 68; for Expansion Joints, see page 168; for Pipe Coverings, see pages 530-531.



Experience and Facilities

Established in 1873, THE PHILIP CAREY COMPANY has furnished millions of squares of roofing, distributed and applied to buildings of every description throughout the world. The Carey mills are modern, and facilities for handling large business are maintained to a high standard.

Carey Roofs

Carey roofs are laid strictly in accordance with the Carey specifications for various weights and thicknesses adapted to meet the requirements of the roof structure, and the conditions to which the roofing will be subsequently exposed.

Carey Felts

Carey felts consist of the best grade of stock, carefully prepared and saturated in asphalt to insure absolute waterproofing protection and permanent flexibility.

Fiberock (Asbestos Asphalt Impregnated Felt)—Used in Carey built-up roofing specifications, also for waterproofing and weatherproofing work. Put up in rolls containing 324 sq. ft.; width, 36 in.; weight about 45 lbs. per roll.

Feltex (Asphalt Saturated Rag Felt)—Used in Carey built-up roofing, waterproofing and weatherproofing work. Furnished in rolls containing 324 sq. ft.; width 36 in.; weight, about 45 lbs. per roll.

Manco (Carey Asphalt Pitch)

More than 40 years' experience in asphalt refining is back of Carey Manco. For roofing purposes, no other asphalt can equal its splendid qualities. If interested in high grade asphalt, write to this company, stating requirements.

Carey Flexible Cement Roofing

The Carey flexible cement roofing is a solid, compact and indivisible sheet of roofing. Its foundation consists of a wool-felt, manufactured from the best grade of stock and saturated so as to render it waterproof and permanently flexible. A heavy body of asphalt cement is laid over the felt foundation. The top reinforcement consists of a strong Calcutta burlap embedded into the asphalt composition, giving great tensile strength to the roofing sheet.

The weight of Carey flexible cement roofing, without any completing materials, is approximately 75 lbs. per square. This roofing was placed on the market in 1885. Since that time it has been extensively used on buildings of every description, in all climates, proving by actual time test its practicable and durable qualities. Furnished in rolls, 1 square each, with necessary materials for proper application.

Carey Asbestos Built-up Roofing

This roof is specified for the most permanent construction, including all types of buildings, flat or steep surfaces, particularly the sawtooth type of construction, where it has been proved in common practice that the ordinary roof covering fails to meet the necessary requirements.

The smooth asphalt finished surface of this roof (see illustration), constantly washed by the rains, always presents a clean and uniform appearance.

Carey Feltex Built-up Roofing

This roofing is constructed of Carey high grade Feltex (asphalt saturated felt), and Manco Asphalt Pitch. It is suitable for buildings of every description, with the exception of those having very steep roof surfaces. The Manco Asphalt Pitch is prepared with a high melting point, and is therefore not affected by any temperature of the sun's heat. It is made for three specifications.

Correspondence

Information and advice respecting the adaptability of Carey roofing specifications to meet any particular requirements will be furnished on request.

Write for samples and further information.



THE LEHON COMPANY

Roofings, Waterproof Papers, Compounds and Flooring Materials

TELEPHONE
LAFAYETTE 0700

West 44th Street and Oakley Avenue
CHICAGO, ILL.

Products

ASPHALT SHINGLES.
ROLL ROOFINGS.
BUILT-UP ASPHALT ROOFING.
WATERPROOF INSULATING PAPER.
WATERPROOF BUILDING PAPERS.

Also manufacturers of the following Mule-Hide products: Asphalt Felt, Waterproofing Asphalt, Waterproof Insulating Fabric, Porch Deck Canvas, Concrete Waterproofing Membranes and Mastic Flooring Materials.

Damp-Tite Waterproofing Compound; Asphalt Paints and Cements; Expansion Joints for Concrete Pavements.

Asphalt Shingles

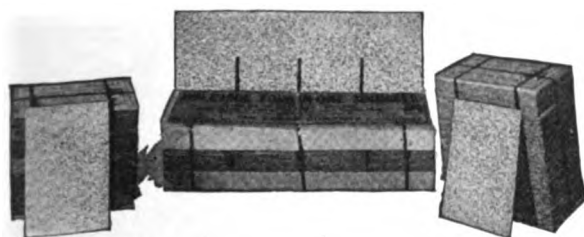
Mule-Hide Asphalt Shingles—May be had in 3 different styles in slate surfaces of unfading red or gray-green.

Mule-Hide Standard Weight Shingles—Size, $8 \times 12\frac{3}{4}$ in. Should be laid 4 in. to the weather. They are furnished in either gray-green or red; 424 shingles to the square.

Approximate weight, 220 to 240 lbs. per square.

Mule-Hide Four-unit Shingles (Four on the Strip)—Similar to what are commonly known as "slab" or "strip" shingles. They are furnished in red or gray-green; 112 strips to the square, sufficient to cover 1 square when laid 4 in. to the weather.

Approximate weight, 200 lbs. per square. Size, 10×32 in.



MULE-HIDE INDIVIDUAL AND FOUR-UNIT SHINGLES

Mule-Hide Double Thick Shingles—Size, $8 \times 12\frac{3}{4}$ in. They are furnished in red or gray-green; 340 shingles to the square, sufficient to cover 1 square when laid 5 in. to the weather.

Approximate weight, 245 to 260 lbs. per square.

Mule-Hide Cor-Du-Roy Asphalt Shingles—These shingles represent the utmost in character and refinement in asphalt roofing. Made in 3 styles as follows:

Four-unit or Strip—Size, 10×32 in. Weight, 225 lbs. to the square.

Individual Extra Heavy—Size, $8 \times 12\frac{3}{4}$ in. Weight, 280 lbs. to the square.

Individual Lock-Level Extra Heavy—Size, $8 \times 12\frac{3}{4}$ in. Weight, 280 lbs. to the square. Space automatically and lock level.



TRADE-MARK

Roll Roofings (Smooth Surface)

Mule-Hide Roll Roofing—Made by a slow process that produces superior saturation with high melting point asphalt, which is less volatile and, therefore, remains elastic for long-time service.

Made 32 in. wide, in rolls containing 108 sq. ft. Special, extra large headed, thin shank galvanized, barbed roofing nails and cement included in each roll.

Made in 2 weights, heavy and extra heavy, approximately 50 to 60 lbs. to the square, respectively.

Mule-Hide Slate-Kote Roll Roofing—Surfaced with either red or gray-green crushed slate. Put up in rolls 32 in. wide, containing 108 sq. ft., complete with nails and cement. Made in 2 weights, 90 lbs. to the square (heavy) and 115 lbs. (extra heavy).

Built-up Asphalt Roofing

Mule-Hide built up asphalt roofing is the modern protection for permanent structures—modern because it is more efficient. Its base consists of Mule-Hide asphalt felt, thoroughly saturated with Mule-Hide waterproof asphalt. This same asphalt is used in mopping between the layers of felt. Specifications furnished on request.

Waterproof Insulating Paper

Mule-Hide waterproof insulating paper is used in the walls of refrigerators, coolers, butcher boxes, refrigerator cars, etc., and has been furnished to the leading refrigerator car lines and railroads operating in the United States.

Has both waterproof and insulating qualities.

Furnished in widths up to and including 112 in., and in weights of 70, 80, 90, 110, 125 and 160 lbs. per 1000 sq. ft.

Waterproof Building Papers

Seal-Skin and Black-Bear waterproof building papers are far superior to red rosin papers because they will not split or crack in any temperature. These waterproof papers are especially suitable for use in cold climates, as they furnish an excellent insulation and effect a decided saving in fuel.

Seal-Skin Waterproof Building Paper—For lining and sheathing walls and floors of houses, refrigerators, cold storage plants, icehouses, etc.; for lining shipping cases, protecting pipes from frost, for use back of stucco work, covering new cement sidewalks, etc.

Furnished in rolls containing 500 sq. ft., weighing from 40 to 45 lbs.; also in rolls containing 250 sq. ft., weighing 20 to $22\frac{1}{2}$ lbs.; 36 in. wide.

Black-Bear Waterproof Building Paper—Desirable for lining and sheathing between walls or floors of houses, barns, poultry houses, refrigerators, etc.

Furnished in rolls containing 500 sq. ft., weighing from 30 to 35 lbs., in widths of 32 and 36 in.

AMERICAN SHEET METAL WORKS

P. O. Box 547
NEW ORLEANS, LA.

Products

PATTERSON CLIPS (Patented) for fastening corrugated roofing and siding to structural steel.

Also, Hollow Metal Windows, Metal Covered Doors, General Sheet Metal Work.

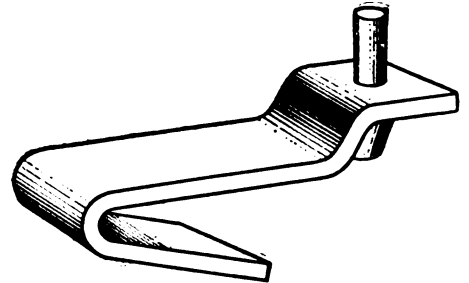
Patterson Clips

Made of No. 12 by $\frac{5}{8}$ -in. soft steel, hot galvanized.

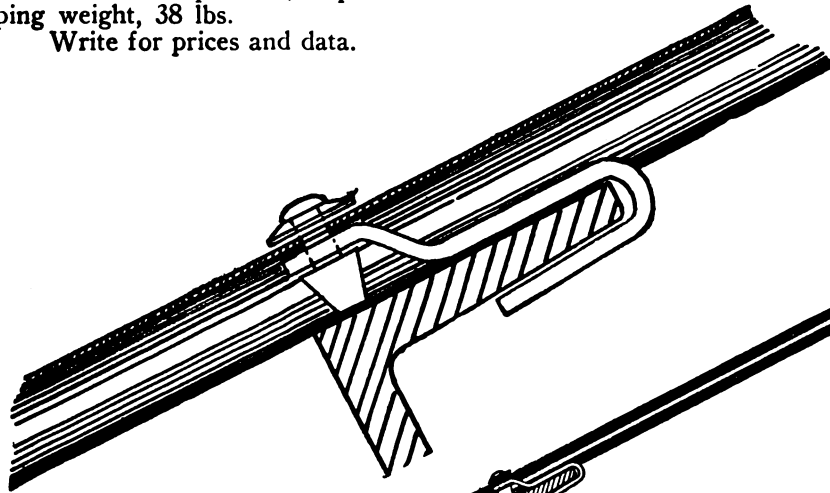
Packed 250 per box, shipping weight, 20 lbs.

Packed 500 per box, shipping weight, 38 lbs.

Write for prices and data.

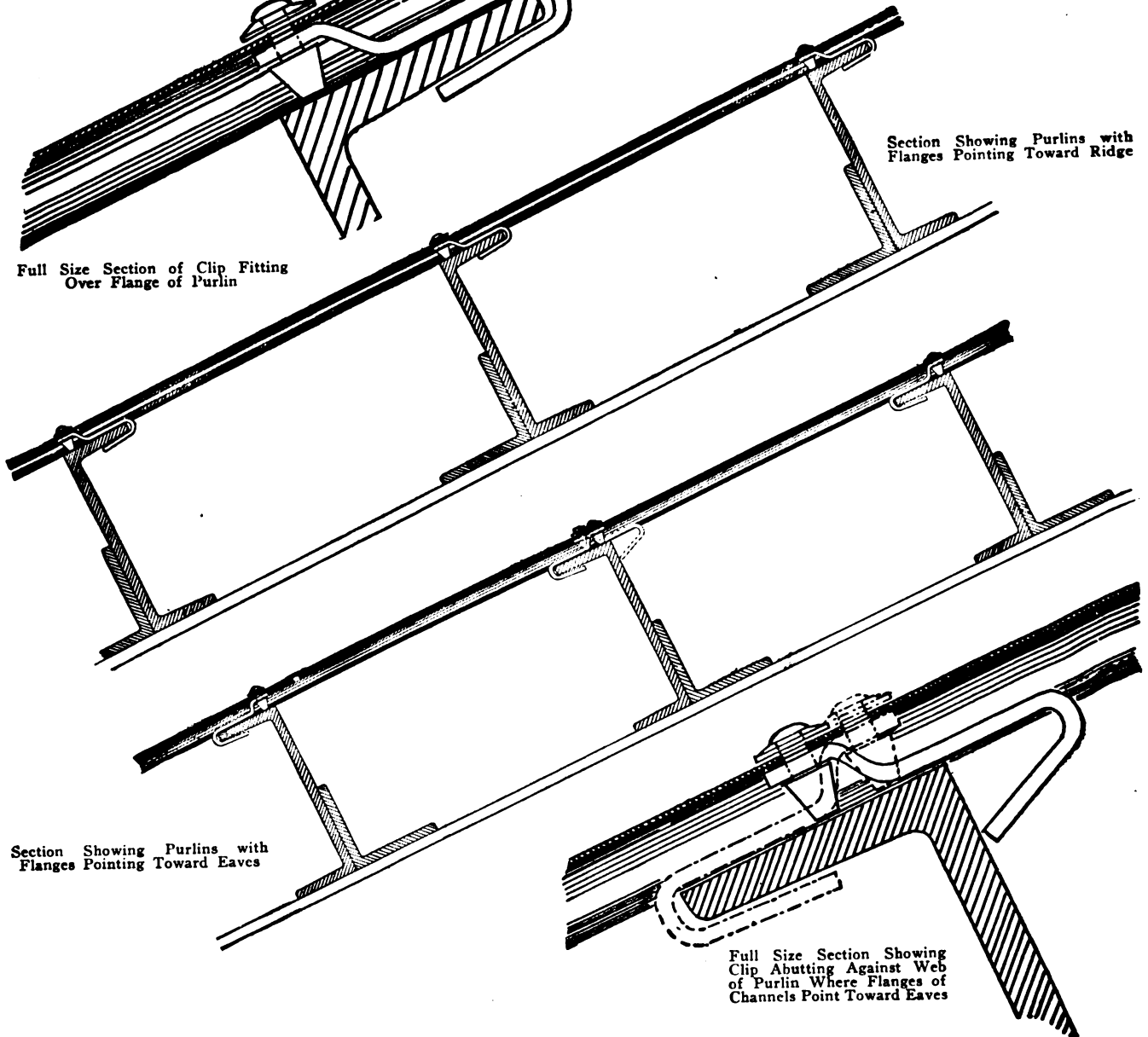


PATTERSON CLIP
Full size



Full Size Section of Clip Fitting
Over Flange of Purlin

Section Showing Purlins with
Flanges Pointing Toward Ridge



Section Showing Purlins with
Flanges Pointing Toward Eaves

Full Size Section Showing
Clip Abutting Against Web
of Purlin Where Flanges of
Channels Point Toward Eaves

ILLUSTRATING VARIOUS METHODS OF FASTENING ROOFING TO PURLINS WITH PATTERSON CLIPS

GRANITE PAVING BLOCK MANUFACTURERS' ASSOCIATION OF THE U. S.

INCORPORATED
JAMES J. TOBIN, FIELD ENGINEER

31 State Street
BOSTON, MASS.

Products

IMPROVED GRANITE PAVING BLOCKS.
GRANITE CURBING.
DURAX (GRANITE CUBE PAVING).

Services

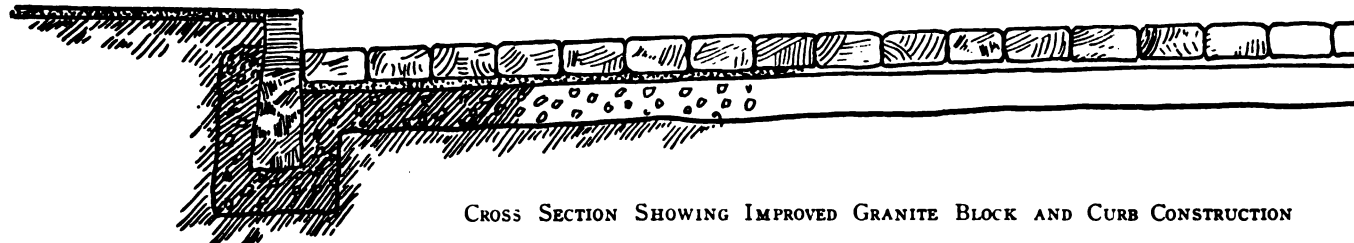
Expert engineering consultation and advice furnished *gratis*, where the materials listed above are under consideration.

Improved Granite Paving Blocks

Specification data adapted from the standard specifications of the American Society of Municipal Improvements.

New Granite Paving Blocks—Paving blocks shall be of medium grained granite, showing an even distribution of constituent materials; of uniform quality, structure and texture; without seams, scales or disintegration; free from an excess of mica or feldspar, and equal in every respect to the sample in the office of the engineer.

Cutting and Dressing—Blocks shall be so dressed that face will be approximately rectangular in shape, and ends and sides sufficiently smooth to permit blocks to be laid with joints not exceeding $\frac{1}{2}$ in. in width at top, and for 1 in. downward therefrom, and not exceeding 1 in. in width at any other part of joint.



CROSS SECTION SHOWING IMPROVED GRANITE BLOCK AND CURB CONSTRUCTION

Top surface of block shall be so cut that there will be no depressions measuring more than $\frac{3}{8}$ in. from a straightedge laid in any direction on top and parallel to the general surface thereof.

Tests—The granite shall have a toughness of not less than 7 and a "French Co-efficient of Wear" of not less than 8.

Tests shall be made by methods described in Bulletin No. 44, United States Department of Agriculture, Office of Public Roads.

The average of 3 tests shall be used for determining toughness and the average of 6 tests for determining the "French Co-efficient of Wear."

STANDARD PAVING BLOCK DIMENSIONS
All dimensions inclusive

Trade name of block	Length, in.	Width, in.	Depth, in.
Five-inch	8 to 12	$3\frac{1}{2}$ to $4\frac{1}{2}$	$4\frac{3}{4}$ to $5\frac{1}{4}$
Four-inch	7 to 11	4 to $4\frac{1}{2}$	4 to $4\frac{1}{2}$
Resurfacing	7 to 11	$3\frac{3}{4}$ to $4\frac{1}{4}$	$3\frac{1}{2}$ to 4
Hassam	6 to 12	$3\frac{1}{2}$ to $4\frac{1}{2}$	4 to $4\frac{1}{2}$
Manhattan	6 to 10	$3\frac{1}{2}$ to $4\frac{1}{2}$	$4\frac{3}{4}$ to $5\frac{1}{4}$

The five-inch block is U. S. standard granite block size developed by the co-operative effort of the Paving Engineers of the Nation and the manufacturers. It is the heavy traffic standard and any variations from this type and size are special sizes and, while the latter have no added benefits, cost more than the standard to make.

Four-inch and resurfacing blocks have been developed to meet the demand for a granite block slightly shallower than the standard, which could be used to replace worn out pavements of other types where the concrete base was in good condition.

The four-inch and Hassam types are in very common use, but the resurfacing block is harder to make and is a special block not carried in stock.

Granite Curbing

No material is as economical or durable as natural granite for curbing.

Those who seek permanent structures at low cost, invariably select granite curbing, which can be cut into circular arcs or straight sections.

Its width gives the curb strength to resist sudden blows. Sufficient depth is necessary to prevent the curb to turn over due to side thrust.

The usual widths run from 4 to 6 in.; depths from 12 to 24 in. Curbs of any dimensions can be manufactured, but those mentioned above are most economical. Although granite does not require a smooth surface to make it appear well, different grades of hammer dressing are usually specified for the exposed face and top of the curb, adding somewhat to the cost.

Granite curbs of hard, sound, medium grained, uniform colored granite, in use for over a century, may be seen still in excellent condition in the older cities. Granite can not be injured by frost, by chemical action nor by repeated heavy blows from vehicles. Unlike limestone or sandstone, it can not be chipped or broken by the heavy loads which are frequently backed against the curb.

Durax Granite Cube Paving

Durax paving blocks are cubes of granite with six approximately square surfaces, the edges of which measure not more than 4 in. nor less than 3 in. in length. The blocks are hand cut from the best granite stock and are irregular both in size and shape in order that they may be paved in concentric arcs of circles and still lay with a close joint. The largest cubes are laid at the top or center of the arc and the smaller cubes at the springing line. By laying the blocks in circular arcs, practically none of the joints are parallel to any line of traffic. This arrangement makes the pavement non-slippery and greatly adds to its wearing qualities.

Durax is usually laid on a 4- to 6-in. concrete base with a 2:1 sand-cement cushion and an asphaltic-mastic joint filler. It is noiseless, dustless, sanitary, and, when properly laid, will withstand any traffic weight.

Durax was first laid in Europe 35 years ago and has been laid in nearly every large city in the United States since 1912.

The present large demand for Durax is directly traceable to the increased weight of automobile truck traffic which has destroyed many miles of brick, wood block, concrete and asphaltic pavements. On most of these streets there is a concrete base which is still good and over which Durax paving blocks can be laid.

NATIONAL PAVING BRICK MANUFACTURERS ASSOCIATION

812 Engineers Building
CLEVELAND, OHIO

MEMBER ASSOCIATIONS

EASTERN PAVING BRICK MANUFACTURERS ASSOCIATION, Lincoln Building, Philadelphia, Pa.

ILLINOIS PAVING BRICK MANUFACTURERS ASSOCIATION, Chamber of Commerce Building, Chicago, Ill.

SOUTHERN CLAY MANUFACTURING COMPANY, Volunteer Building, Chattanooga, Tenn.

INDIANA PAVING BRICK MANUFACTURERS ASSOCIATION, Fidelity Trust Building, Indianapolis, Ind.

OHIO PAVING BRICK MANUFACTURERS ASSOCIATION, Hartman Building, Columbus, Ohio

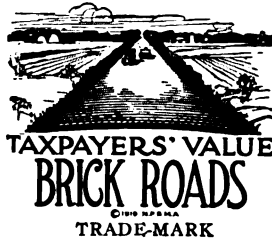
Products

VITRIFIED PAVING BRICK and other Vitrified Brick.

Uses

Vitrified Paving Brick are used for the wearing surface of streets and highways, alleys, driveways, walks and sidewalks, street railway track paving, railway station platforms, factory floors, freight yard paving, areas and drives about manufacturing establishments, bridge floors and other miscellaneous wearing surfaces. They are frequently used in the construction of sewers and conduits as well as in buildings such as factories, garages, dwellings and warehouses; also in foundations of all kinds, including engine beds, bridge piers. Other suitable structures for the use of vitrified paving brick are bridges of various types, tanks and silos.

Vitrified Paving Brick may be used for all the purposes enumerated. For uses other than paving, selected



off-grades may be specified. Only first grade, (Number 1) material should be specified for street and highway paving.

Standard Vitrified Paving Brick

Selection of type of vitrified paving brick should be made from the standard vitrified paving brick of the Committee on Simplification of Variety and Standards

for Vitrified Paving Brick of the U. S. Department of Commerce. These are 11 in number, subject to further simplification, as follows:

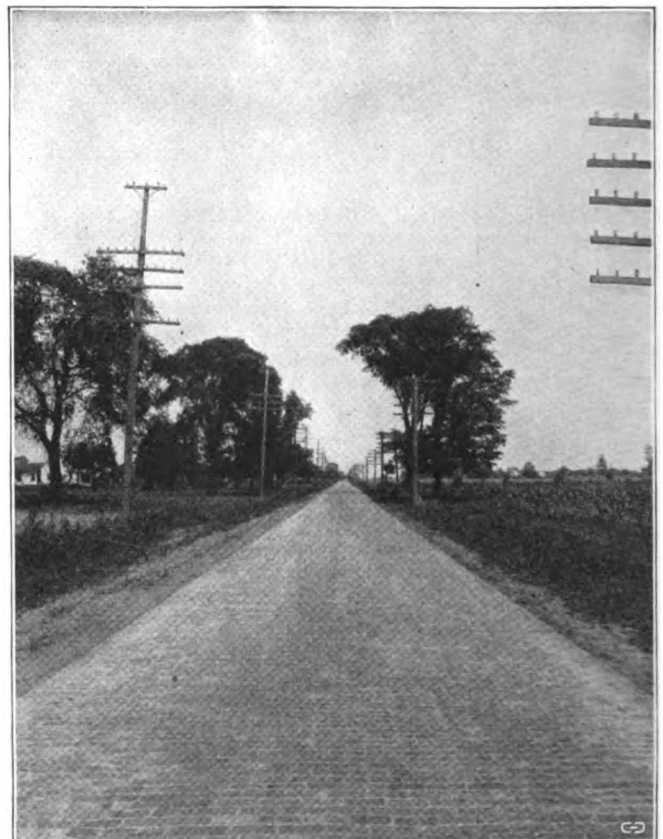
Plain Wire-Cut Brick (Vertical Fibre Lugless)—
 $3 \times 4 \times 8\frac{1}{2}$ in. $3\frac{1}{2} \times 4 \times 8\frac{1}{2}$ in.

Repressed Lug Brick—
 $3\frac{1}{2} \times 3\frac{1}{2} \times 8\frac{1}{2}$ in. $3\frac{1}{2} \times 4 \times 8\frac{1}{2}$ in.

Vertical Fibre Lug Brick—
 $4 \times 3 \times 8\frac{1}{2}$ in. $4 \times 3\frac{1}{2} \times 8\frac{1}{2}$ in.



WOODHILL ROAD, CLEVELAND, OHIO, PAVED WITH VITRIFIED BRICK
SWEET'S CATALOGUE



A BRICK PAVED COUNTRY HIGHWAY

Continued on next page

Wire-Cut Lug Brick (Dunn)—

$3\frac{1}{2} \times 3 \times 8\frac{1}{2}$ in. $3\frac{1}{2} \times 3\frac{1}{2} \times 8\frac{1}{2}$ in.
 $3\frac{1}{2} \times 4 \times 8\frac{1}{2}$ in.

Hillside Lug Brick (Dunn)—

$3\frac{1}{2} \times 4 \times 8\frac{1}{2}$ in.

Hillside Lug Brick (Repressed)—

$3\frac{1}{2} \times 4 \times 8\frac{1}{2}$ in.

Joint Filler

Asphalt Filler is the preferred type of joint filler for vitrified brick wearing surfaces, without prejudice to other types of filler which may have special utility in special instances of construction.

ESTIMATING DATA

Kind of Brick	Laid	Depth of Wearing Surface	Number to Lay 1 Sq. Yd.
Plain Wire-cut Brick: All sizes $3\frac{1}{2}$ in. size	Flat	3 and $3\frac{1}{2}$ in.	36
	Edge	4 in.	40
Repressed Lug Brick: All sizes including "Hill-sides"	Edge	$3\frac{1}{2}$ and 4 in.	40
Vertical Fibre Lug Brick: All sizes	Flat	3 and $3\frac{1}{2}$ in.	36
Wire-cut Lug Brick: All sizes including "Hill-sides"	Edge	3, $3\frac{1}{2}$ and 4 in.	40

Approximate Weights

The average weight of vitrified paving brick is approximately .084 lbs. per cu. in. With a 3-in. depth of wearing surface, plain wire-cut brick, filler squeezed, approximately 12 lbs. of asphalt filler are required per square yard and 14 lbs. for the $3\frac{1}{2}$ -in. depth. Up to 15 lbs. of filler per square yard are required for lug brick in the 4-in. depth. Other depths about in proportion.

Specifications

The NATIONAL PAVING BRICK MANUFACTURERS ASSOCIATION will furnish through its Member Associations, paving specifications and information on other uses for vitrified paving brick, on request.

Merits

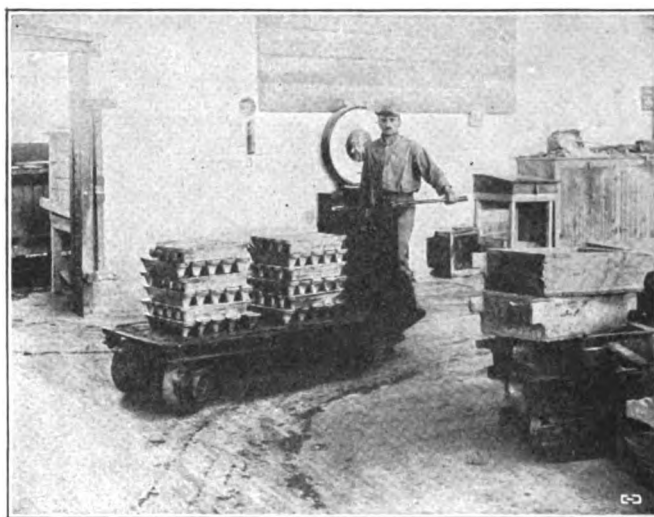
Vitrified Paving Brick excel for all paving use on account of their superior wearing qualities, low repair and maintenance costs, extreme durability under severest use and their consequent long-run economy.

Prices

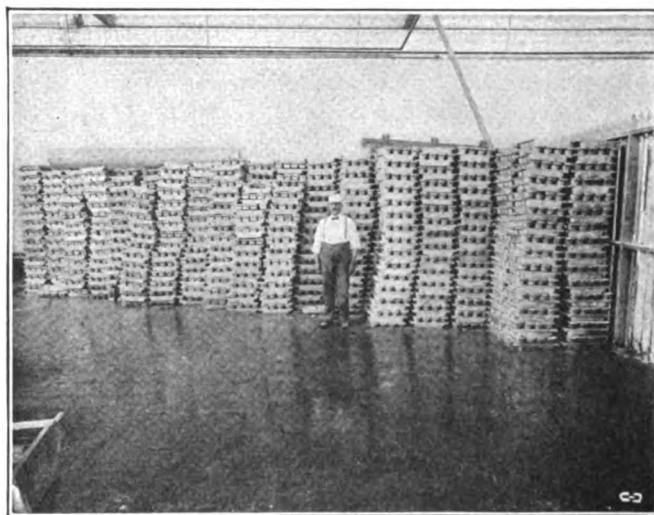
Requests for price quotations made to any of the Associations listed above will be referred to individual manufacturers from whom quotations may be obtained.

Co-operative Service

The offices of the NATIONAL PAVING BRICK MANUFACTURERS ASSOCIATION and its members are always ready to consult with engineers and architects concerning vitrified paving brick and their uses. These offices will be glad to furnish all detailed information within their power, and in general to be as useful as possible in aiding the solution of any problem.



VITRIFIED PAVING BRICK FLOOR IN WILLARD STORAGE BATTERY COMPANY PLANT
 Note weight of pig lead being trucked



ENORMOUS WEIGHT OF PIG LEAD STACKED ON VITRIFIED PAVING BRICK FLOOR IN WILLARD STORAGE BATTERY COMPANY'S PLANT



BRIDGE PAVED WITH VITRIFIED PAVING BRICK

KUSHEQUA KERAMIC COMPANY

ELISHA K. KANE, LESSEE

Manufacturer of Oxblood Floor and Roof Tiles

KUSHEQUA, PA.

Products

KUSHEQUA FLOOR TILE, COVE BASE and WAINSCOT TRIM; ROOF TILES.

Oxblood Tiles

Oxblood tiles show superiority in clear, deep red color, high vitrification, even texture and neat finish. No artificial glaze or coloring, the color and substance being uniform throughout.

The material is a stratified mountain shale of uniform composition. It is ground very fine and highly vitrified by natural gas.

Size and Grading

Oxblood tiles are made in 4 principal sizes: 1x6x9 in. (Promenade), 1 $\frac{1}{8}$ x12x12 in. (Quarry), 1 $\frac{1}{8}$ x9x9 in. (Quarry), and 1x6x6 in. (Quarry).

The Promenade size is graded into 3 qualities: flooring quality (very choice), roofing quality (suitable for floors, excellent for roofs) and seconds (serviceable for roofs or cheap floors). The Quarry sizes are graded into flooring quality (choice) and seconds (slightly defective). All sizes have also thirds (inferior).

When crated, 12 sq. ft. fill each crate.

Color

Each grade and size is sorted into 3 shades of clear red color: A (dark red), B (deep red) and C (bright red). Oriental tiles, with dark red centers fading toward gray edges, are also made in 6x6 in. and 6x9 in.

Specials

A full line of cove base, quoins, angles, wainscot caps, plinths, step treads, risers, coping and other shapes are carried in stock. Also, key quarries, 3 in. and 1 $\frac{1}{2}$ in., red or black, diagonals and fractional tile for course starters. Other special shapes are made to order on reasonable notice. See following page.

Uses

Vitrified tiles are used wherever there is need for a surface which is proof against fire, frost, water, acid, grease and dirt. If, in addition to these requirements, beauty of color and resistance to wear are required, Kushequa oxblood tiles are best.

Flooring quality is recommended for parlors, halls, dining rooms, restaurants, hospital operating rooms and laboratories. Roofing quality for roof gardens, roofs, porches, promenades, kitchens, laundries, packing houses, engine rooms, bridges, etc. Seconds for roofs, dye vat linings, acid towers, fertilizer plants.

Facilities

Monthly output 250,000 tile. Large stock enables prompt shipment.

Transportation facilities unexcelled, factory connected with Erie R. R., Buffalo, Rochester & Pittsburgh R. R., Pennsylvania R. R. and Baltimore & Ohio R. R.

Direct Sale

Although represented in principal cities by capable wholesale dealers, customers who so desire may buy



Copyright 1916 by Equitable Office Building Corporation

EQUITABLE BUILDING, NEW YORK, N. Y.

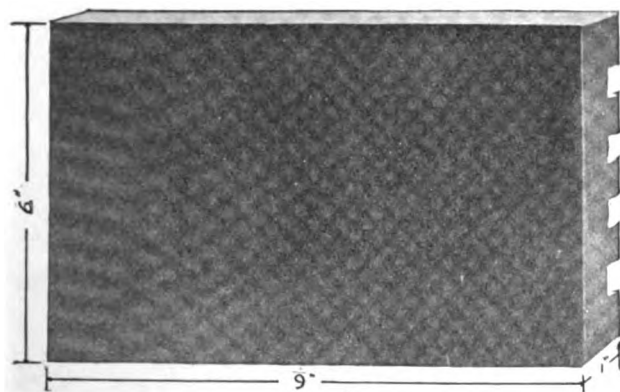
GRAHAM-BURNHAM, Architects

Roofed with Kushequa Promenade Tile

direct at open published prices. In these, however, there is a reasonable discrimination in favor of tile setters and dealers.

References

Stock Yards Inn, Chicago, Ill., R. L. Lindstrom, Architect
Engineering Laboratory, University of Michigan, Ann Arbor, Mich., Smith, Hinchman & Gryllis, Architects
Niagara Falls Bridges, Niagara Falls, N. Y.
Canadian Pacific Hotels, Edmonton and Laggan, Alta.
Tennessee Coal and Iron & Railroad Co., Fairfield, Ala.
Metropolitan Museum of Art, New York, N. Y., McKim, Mead & White, Architects
Swift & Co., Packing House, Montreal, Que.
Giles Residence, Orlando, Fla., L. Percival Hutton, Architect
Geological Building, Interior Department, Washington, D. C.
Bureau of Engraving and Printing, Washington, D. C.
J. K. Billings, Residence, Locust Valley, L. I., Guy Lowell, Architect
Rockefeller Institute, East 64th Street, New York, N. Y., Shepley, Rutan & Coolidge, Architects
High School, Waterbury, Conn., Griggs & Hunt, Architects
St. Augustine's Church, Convent and School, San Juan, P. R.
Broadmoor Hotel, Colorado Springs, Colo.
Pennsylvania Hotel, 33rd Street and 7th Avenue, New York, N. Y., McKim, Mead & White, Architects
University of Southern California Administration Building, Los Angeles, Cal., John Parkinson, Architect



Oxblood Promenade Tile

Straight Sizes

Nos. 120 and 121, 12x12 in.
Nos. 9 and 92, 9x9 in.
Nos. 1, 10, 11, 12, 13 and 14, 6x9 in.
Nos. 6, 60, 61 and 62, 6x6 in.
Nos. 3 and 22, 3x3 in.
Nos. 2 and 20, 1½x1½ in.

Fractional Sizes

No. 99 Diagonal, 9x9 in.
No. 26 Diagonal, 6x6 in.
No. 95 Starter, 9x4½ in.
No. 24 Starter, 6x4½ in.
No. 23 Starter, 6x3 in.



Internal Quoin

No. 64, height, 6 in.
No. 54, height, 6 in.
No. 34, height, 3 in.

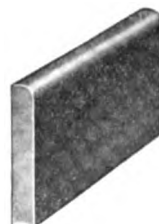


External Quoin

No. 65, height, 6 in.
No. 55, height, 6 in.
No. 35, height, 3 in.



No. 58, Right Stop
No. 59, Left Stop
No. 68, Right Stop
No. 69, Left Stop



Bullnose

No. 80, 6x9 in.
No. 81, 6x6 in.



Internal Radius

No. 76, 6 in.
No. 77, 9 in.



External Radius

No. 78, 6 in.
No. 79, 9 in.



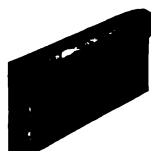
External Cove Angle, Left Hand

No. 43, height, 4½ in.
No. 53, height, 6 in.
No. 42, height, 4½ in., Right Hand
No. 52, height, 6 in., Right Hand



Cove Base, 4½ in., Square Top

No. 40, height, 4½ in.; length, 9 in.
No. 46, height, 4½ in.; length, 6 in.
No. 50, height, 6 in.; length, 9 in.
No. 56, height, 6 in.; length, 6 in.
No. 30, height, 3 in.; length, 9 in.
No. 36, height, 3 in.; length, 6 in.



Wainscot Cap

No. 70, 4 in. high,
9 in. long
No. 71, 4 in. high,
6 in. long



Bullnose Stop
No. 82, 6x6 in.



No. 100. Porch Coping

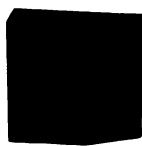


No. 101. Coping Corner



Internal Cove Angle

No. 41, height, 4½ in.
No. 51, height, 6 in.



Square Plinth

No. 57, height 6 in.
No. 47, height, 4½ in.
No. 67, Rounded



Cove Base, 6 in., Round Top

No. 63, length, 9 in.
No. 66, length, 6 in.

No. 72 Cap
Internal QuoinNo. 73 Cap
External Quoin

No. 102 Step Tread Tile

KUSHEQUA PROMENADE TILE, SANITARY BASES AND WAINSCOTS

NUMERICAL LIST OF ABOVE TO FACILITATE ORDERING BY NUMBER

- | | |
|---|--|
| 1 Promenade Tile, 6x9x1 in., Flooring Quality | 60 Quarry, 6x6x1 in., Oriental, Flooring Quality |
| 2 Key Quarry, 1½x1½x1 in., Flooring Quality | 61 Quarry, 6x6x1 in., Seconds |
| 3 Key Quarry, 3x3x1 in., Flooring Quality | 62 Quarry, 6x6x1 in., Oriental, Seconds |
| 4 Key Quarry, 4x4x1 in., Flooring Quality | 63 Cove Base, 6 in. high, round top |
| 6 Quarry, 6x6x1 in., Flooring Quality | 64 Cove Base, 6 in. high, round top, Internal Quoin |
| 9 Quarry, 9x9x1½ in., Flooring Quality | 65 Cove Base, 6 in. high, round top, External Quoin |
| 10 Promenade Tile, Oriental, Flooring Quality | 66 Cove Base, 6 in. high, round top, 6 in. long |
| 11 Promenade Tile, Roofing Quality | 67 Cove Base, 6 in. high, Plinth, all edges rounded |
| 12 Promenade Tile, Second Quality | 68 Cove Base, 6 in. high, round top, Right Stop |
| 13 Promenade Tile, Third Quality | 69 Cove Base, 6 in. high, round top, Left Stop |
| 14 Promenade Tile, Oriental, Seconds | 70 Wainscot Cap, 4 in. high, 9 in. long |
| 20 Key Quarry, 1½x1½x1 in., Blackish | 71 Wainscot Cap, 4 in. high, 6 in. long |
| 22 Key Quarry, 3x3x1 in., Blackish | 72 Wainscot Cap, 4 in. high, Internal Quoin |
| 23 Course Starter, 6x3x1 in. | 73 Wainscot Cap, 4 in. high, External Quoin |
| 24 Course Starter, 6x4½x1 in. | 74 Wainscot Cap, 4 in. high, Internal or External Miter |
| 25 Course Starter, 3x9x1 in. | 75 Wainscot Cap, 4 in. high, Right or Left Stop |
| 26 Diagonal, 6x6x1 in. | 76 Wainscot, Internal Radius 6 in. |
| 30 Cove, 3 in. high, square top, 9 in. long | 77 Wainscot, Internal Radius 9 in. |
| 34 Cove, 3 in. high, square top, Internal Quoin | 78 Wainscot, External Radius 6 in. |
| 35 Cove, 3 in. high, square top, External Quoin | 79 Wainscot, External Radius 9 in. |
| 36 Cove, 3 in. high, square top, 6 in. long | 80 Bullnose, 6x9x1 in. |
| 40 Cove Base, 4½ in. high, square top, 9 in. long | 81 Bullnose, 6x6x1 in. |
| 41 Cove Base, 4½ in. high, square top, Internal Angle | 82 Bullnose Stop, 6x6x1 in. |
| 42 Cove Base, 4½ in. high, square top, External Angle, Right Hand | 83 Bullnose, Internal Quoin, 6 in. high |
| 43 Cove Base, 4½ in. high, square top, External Angle, Left Hand | 84 Bullnose, External Quoin, 6 in. high |
| 46 Cove Base, 4½ in. high, square top, 6 in. long | 90 Quarry, 9x9x1½ in., Oriental |
| 47 Cove Base, 4½ in. high, square top, Plinth | 92 Quarry, 9x9x1½ in., Second Quality |
| 50 Cove Base, 6 in. high, square top, 9 in. long | 95 Course Starter, 9x4½x1½ in. |
| 51 Cove Base, 6 in. high, square top, Internal Angle | 99 Diagonal, 9x9x1½ in. |
| 52 Cove Base, 6 in. high, square top, External Angle, Right Hand | 100 Porch Coping, 6x9x2 in. |
| 53 Cove Base, 6 in. high, square top, External Angle, Left Hand | 101 Porch Coping Corner, 9x9x2 in. |
| 54 Cove Base, 6 in. high, square top, Internal Quoin | 102 Step Tread Tile, 6 in. wide, 9 in. long |
| 55 Cove Base, 6 in. high, square top, External Quoin | 103 Step Tread Tile, 6 in. wide, 6 in. long, External Corner |
| 56 Cove Base, 6 in. high, square top, 6 in. long | 106 Step Tread, 6 in. wide, 6 in. long |
| 57 Cove Base, 6 in. high, square top, Plinth | 107 Threshold, 7 in. wide, 9 in. long |
| 58 Cove Base, 6 in. high, square top, Right Stop | 120 Quarry Tile, 12x12x1½ in., Flooring Quality |
| 59 Cove Base, 6 in. high, square top, Left Stop | 121 Quarry Tile, 12x12x1½ in., Second Quality |

CARTER BLOXONEND FLOORING CO.

SALES OFFICES

KANSAS CITY, MO., Long Building
Telephone, Main 1177
CHICAGO, ILL., 332 South Michigan Avenue
Telephone, Harrison 6491

BOSTON, MASS., 312 Broad Exchange Building—Telephone, Fort Hill 2390

MILLS: KENSETT, ARK.

CLEVELAND, OHIO, 1900 Euclid Avenue
Telephone, Prospect 403
NEW YORK, N. Y., 501 Fifth Avenue
Telephone, Murray Hill 558

Product

BLOXONEND FLOORING, a "Built-up" Wood Block Flooring (blocks anchored to base).

Uses

For heavy service floors in factories, warehouses, shipping rooms, shops, freight houses, baggage, mail and express rooms, railroad stations, baggage, mail and express cars, bakeries, industrial schools, elevator and scale platforms, subjected to trucking (hand or power), or concentrated footwear, where practically everlasting smoothness is the desideratum.

Advantages

Durability. Resilience. Smoothness. Adds to volume and efficiency of production. Absorbs vibration. Insulates. Warm. Quiet. Comfortable. Smooth but not slippery. Firm, safe foothold. A soft bed for tools or materials dropped. Advantages of good block pavement, with greater smoothness and adaptability of best matched flooring to building work, whether steel, concrete or wood structure, new or old.

Construction

Built up at our plant in flooring sections approximating 8 ft. long (Fig. 1). (Should not be confused with loose paving blocks.) Blocks of selected Southern pine, on end, are dovetailed to horizontal baseboards, presenting end of grain to wear, forming flooring sections which are finished to uniform height and grooved in the sides for heavy splines (slip tongues). Splines are used to break joints, giving support to end joints and keeping flooring sections in alignment.

Size

Standard sections are built with 2-in. blocks dovetailed onto base made from 1-in. stock. When finished ready to ship, sections measure $2\frac{1}{8}$ in. thick by $3\frac{1}{2}$ -in. face, in lengths up to 8 ft.

Application

(1) **Over Concrete, Standard** (Fig. 2)—Laid at right angles on and nailed to beveled sleepers either bedded in slab or laid over slab and filled flush, breaking joints on sleepers as far as possible and shimming with shingles at points where the concrete does not furnish firm level support. 2- by 4-in. sleepers at 15½-in. centers are standard. Size of sleepers can be increased and centers reduced for extra heavy or exposed service or other special conditions. Advice for such special conditions furnished on receipt of details.

(2) **Over Concrete, Alternate**—Over concrete slab or old concrete floors grouted smooth, Bloxonend may be laid at right angles on flat strips not bedded. Strips should practically cover slab. 1- by 6-in. strips (SIS) standard. Nail through base into every alternate strip at such angle that nail will not pierce the lower face of same, forming whole into compact floating floor or mat. Only for dry locations and occupations, and where height or weight of sleepers and fill are objectionable.

(3) **Over Wood Structure**—Over joists or open sleepers Bloxonend should be laid on substantial subfloor of assured proper thickness to furnish firm level support without deflection according to spans and loads contemplated, allowing for

Bloxonend itself tensile strength of a good inch floor. Where structural conditions admit and service requires, subfloor laid diagonally at not less than 45° to supports (or better 60° or 75°) and Bloxonend at right angles to supports will preserve maximum strength and stiffness of both.

(4) Special, Over Concrete or Wood

(Fig. 3)—For laying under uniform moisture conditions over concrete without nailing strips or over wood subfloor, Bloxonend can be furnished bored for countersinking with special nails in position for lateral nailing through spline into next section to draw sections together into tight, smooth surface. Where desirable, thin coating of pitch may be squeegeed on subbase to equalize slight irregularities, furnish partial binder or waterproofing. Write for more detailed instructions.

(5) **Nailing**—Bloxonend may be toe-nailed through base before inserting splines, blind nailed in groove or nailed through splines after same are inserted, according to location and use of floor. Nails will vary in gauge and length with location and method of nailing. More detailed instructions for laying specific jobs will be furnished on application.

Treatment

Bloxonend can be treated before shipment where specified. Treatment is essential for exposed use and desirable in other places where the nature of occupation does not make it objectionable and maximum life is essential.



FIG. 1. CROSS SECTION OF BLOXONEND

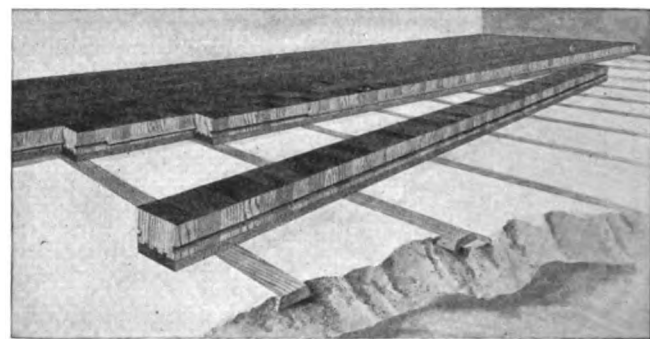


FIG. 2. BLOXONEND ON BEVELED SLEEPERS IN CONCRETE

Position of nail after it is driven home on job by use of a simple nailing device

Position of nail in countersunk bore as it comes to job from factory

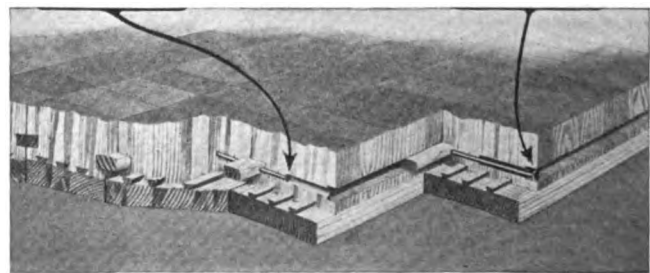


FIG. 3. BLOXONEND Laterally Nailed

THE JENNISON-WRIGHT COMPANY

Manufacturers of Kreolite Wood Block Floors

2480 Broadway

TOLEDO, OHIO

BRANCH OFFICES IN ALL PRINCIPAL CITIES

Products and Services

KREOLITE WOOD BLOCK FLOORS and
PAVEMENTS.

SPECIALISTS IN WOOD PRESERVING.

This company maintains a corps of expert superintendents for the purpose of instructing purchasers how to properly install Kreolite wood block floors, or to supervise the construction; if preferred, they can arrange to install the floors.

Use

Kreolite wood block floors are guaranteed to stand up under the most severe service. They are used in factories, machinshops, warerooms, loading platforms, annealing rooms, foundries, pickling rooms, dye rooms, glass factories, paper mills, rubber tire plants, garages and stables.

General Description of Kreolite Wood Blocks

Manufactured in special designs to meet exact conditions. They are rectangular in shape, surfaced on two sides and one end to a uniform size, 3 to 4 in. in width and from 2 to 4 in. in depth, depending on the severity of service. All blocks are furnished of the same width and depth for any one job.

Material—All blocks are manufactured from carefully selected Southern long leaf yellow pine, thoroughly air seasoned and free from bark, loose or rotten knots or other injurious defects and set in floor with end grain up.

Treatment—All blocks for interior floors are treated in air tight cylinders by the Kreolite pressure and vacuum process, as much Kreolite creosote oil being forced by hydraulic pressure into the timber as it is possible to inject under safe temperatures and pressures, but in no case leaving less than 6 lbs. of oil per cubic foot of timber.

Blocks that are to be used for exterior purposes, such as driveways, loading platforms and court pavements, or that are subjected to much moisture, are treated by the Kreolite "two-stage" process, which consists of a second application of hot Kreolite oil injected to insure a more thorough waterproofing of the blocks.

A pure grade of Kreolite creosote oil is used.

Conspicuous Features—In the average machine-shop or iron working plant where sharp heavy castings are handled or where trucking is done, Kreolite wood blocks will outwear any other type of floor except iron plates. United States Government experts rank wood blocks just slightly below granite blocks in point of

KREOLITE

TRADE-MARK

durability. The dropping of iron castings or the constant passing of heavy trucks on Kreolite wood blocks has the tendency to further compress the fibers, making the blocks tougher and harder.

After a Kreolite wood block floor is once laid there will be no expense for repairs for many years to come. As the blocks are not ground by wear, there is no dust to get into the bearings of valuable machinery. They are non-conductors of heat and very easy on the workmen's feet.

Specifications for Installing Kreolite Block Floors

The following method of laying Kreolite blocks is recommended for the average floor. Special specifications will be gladly furnished for unusual conditions.

Concrete Foundations—(Concrete foundations are recommended to be used wherever practicable). The minimum thickness of concrete base shall be not less than 4 in. and shall increase in thickness, depending on load the floor is designed to carry. Under extremely heavy loads and impact where settling of the subgrade is liable to occur, reinforcements shall be placed to distribute the load. The concrete base shall be composed of 1 part portland cement, 3 parts sand and 6 parts stone or gravel, or hard, clean cinders. The top of the concrete foundation shall be brought to a true, smooth and even surface exactly the depth of the block below top of finished floor.

Pitch Cushion—After the concrete has thoroughly dried out, it shall be given a thin and even coating of hot Kreolite bituminous cement not over $\frac{1}{8}$ in. in thickness, which shall be allowed to harden before laying of the blocks.

Alternate Dry Mortar Cement—If the concrete is not finished smooth or level enough to permit the block to be laid directly thereon, it shall be brought to a true and even surface with dry cement mortar, mixed 1 part portland cement and 4 parts sand. This should be mixed dry and well sprinkled with water just before the blocks are laid.

Manner of Laying—The blocks shall then be laid tightly together, with grain vertical directly upon the cushion as prepared, with their length at right angle to line of traffic, care being taken to break joints by at least 2 in. After every 4 rows of blocks shall have been laid in place, the courses shall be lined up and driven together as tightly as possible by means of a 2x4 plank laid alongside the outside edge of the blocks. The blocks in each separate row shall also be tightened lengthwise by forcing them together from the end with a lever, pick or other instrument. When the dry mortar cushion has been used the blocks shall be rolled or tamped until they are brought to a smooth surface immediately after laying.

Application of Filler—After the blocks have been laid in place and brought to as true and level a surface as possible, the joints between the blocks shall be filled with Kreolite bituminous filler, applied hot. The filler should be applied by flushing over the surface of the floor, using a rubber-edged squeegee to force it into the joints. Care must be taken to see that the filler penetrates the full depth of the blocks and that the joints are completely filled at the time of application. Dry sand shall then be swept over the floor, completely covering the blocks, same to be left there until the blocks are well set.

Expansion Joints—Against walls on all sides of the floor, as well as around all columns and other obstructions, there shall be laid a bituminous expansion joint 1 in. in width.

Solution of Various Floor Problems

Kreolite wood block floors have been installed in hundreds of manufacturing plants throughout the country under every conceivable condition of service. Fully 85% of these users have sent in repeat orders, which is first class evidence that factory managers and engineers regard Kreolite floors as a good investment.



KREOLITE GROOVED
BLOCK
For dry conditions



KREOLITE KOUNTERSUNK
LUG BLOCK
For wet conditions

THE RODD CO.

Contract Engineers for Redwood Block Floors manufactured by The Pacific Lumber Company of San Francisco
PITTSBURGH, PA.

Products and Service

Sole Eastern Contract Engineers for CALIFORNIA REDWOOD BLOCK FLOORS.

Slogan

"Everwearing Floors that do not Shrink or Buckle."

Why California Redwood Is Unrivalled for Wood Block Floors

Resists Decay—Some years ago the trunk of a California Redwood was found buried under the roots of a forest giant whose age, indicated by the annular rings, was more than 600 years. For over six centuries the Redwood had lain in the moist earth. Yet when it was dug up it was sound and free from decay or worm holes. It was sawn into good lumber.

Here is indisputable evidence of one very desirable quality in wood for block floors—*resistance to rot* and the aversion of worms and insects.

No Treatment Necessary—Redwood *requires no preservative treatment*. During the long centuries of growth every fiber of Redwood is impregnated by a *natural* odorless preservative which protects the wood fiber against the development of decay-producing fungus and against the ravages of boring worms and insects.

This gives Rodd Redwood floors several points of superiority over ordinary wood block floors. In the first place *the cost of treating the blocks is saved*.

Light Color—Then there is the advantage of lighter colored floors which makes for *lighter, more pleasant working conditions*.

Freedom from Odor—A third and important advantage is the *absence of odor*. Freedom from pitch and resin makes Redwood odorless. The pungent odor

of treated blocks makes floors of that type undesirable for dairies and food storage depots because of the injury the strong odors do to so many kinds of foods. The odor also rules out treated block floors for many other purposes where the advantages of wood block floors would otherwise lead to their specification. Redwood block floors are untreated and odorless.

Shrinkage and Expansion—An objection to wood block floors has been their tendency to swell and shrink under conditions of moisture and dryness. Seasoned Redwood has a very *low coefficient of contraction and expansion*. Exhaustive tests and experiments have proved that Redwood block floors stay flat.

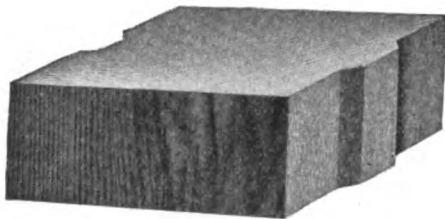
Under heavy traffic conditions the ends of the wood fiber iron out and form a surface that grows stronger with use. It does not crack or corrugate, does not become slippery and is comparatively noiseless.

Rodd Redwood floors can be laid and sanded absolutely smooth, and are therefore suitable for situations where treated blocks can not be used, or where a finished surface which will not catch lint is desired. The surface of the floor may be filled and varnished to a gloss, or velvet waterproof finish and, if desired, can be stained any color.

These are some of the reasons why we have standardized on California Redwood block floors.

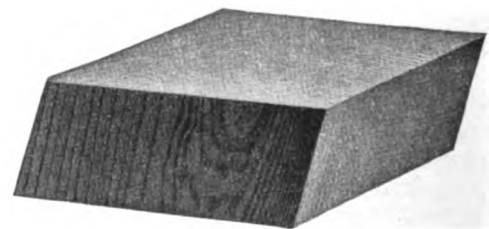
The Desirable Qualities of Redwood Block Floors

Rodd floors have all the qualities of a perfect wearing floor surface—smooth, noiseless, wonderfully resilient, and durable, always at an even temperature. Splinters, nails, warps and the rapid wear of plank floors, as well as the hard, cold, slippery and dust-producing qualities of non-resilient surfaces are entirely eliminated. The first cost is reasonable and the upkeep cost



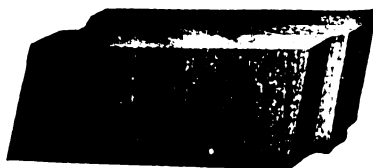
BEVELED LOCKBLOX—A

Cut from 4 x 6-in. stock. Matched, tongued and grooved as shown. Variation in depth or width not to exceed $\frac{1}{8}$ in.



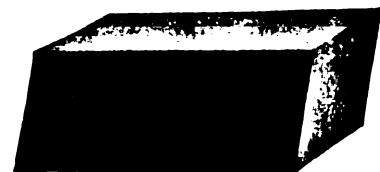
BEVELED BLOCK—C

Manufactured from 4 x 6-in. stock. S4S to $3\frac{3}{4}$ x $5\frac{1}{2}$ in., or SISIE to $3\frac{3}{4}$ x $5\frac{1}{2}$ in. Variation in width and depth not to exceed $\frac{1}{4}$ in.



BEVELED LOCKBLOX—B

Cut from 2 x 6-in. stock. Matched, tongued and grooved as shown. Variation in depth or width not to exceed $\frac{1}{8}$ in.



BEVELED BLOCK—D

Manufactured from 2 x 6-in. stock. S4S to $1\frac{3}{4}$ x $5\frac{1}{2}$ in., or SISIE to $1\frac{3}{4}$ x $5\frac{1}{2}$ in. Variation in width and depth not to exceed $\frac{1}{4}$ in.

practically nil. Rodd Redwood floors stand the wear and tear of heavy service indefinitely.

The "Bulletin of Safe Practices" issued by the National Safety Council gives these requirements for a good floor:

"(a) It should be as nearly noiseless as possible. A noisy floor may wear well, but the noise of feet, truck wheels and machinery has an irritating effect on workmen.

"(b) It should be dry, of low heat conductivity, durable and easily cleaned.

"(c) It should not be slippery or be made of material which will wear slippery.

"(d) It should be smooth and free from nails, bolts, and other projections; also from holes and splinters, etc."

Discussing concrete floors the Bulletin disapproves them for these reasons:

"Their quality of cold and dampness when used in basements and their bad effects on the feet of men working at benches or machines."

The same may be said of brick or asphalt floors. Another objectionable feature of concrete floors is the great amount of dust they produce.

The best engineering practice favors wood block floors in place of cement floors for an ever-widening range of uses.

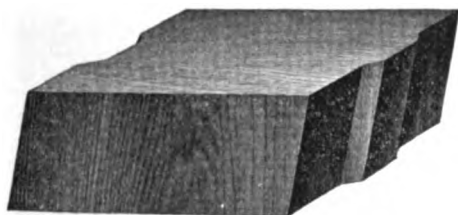
The Value of Good Floors

Good floors are a vital element in the cost of production. In mills, factories, machinshops, warehouses, freight sheds and piers, the good condition of the floors should be as carefully maintained as the good condition of the tracks and roadbed of a railroad.

In all these places good floors *that stay in good condition* prevent much unnecessary expense for the repair and upkeep of hand trucks. They keep down the loss caused by dropped tools and machined parts. They make transportation of goods and materials from one department to another easier, safer, faster and more economical. They help to speed up production.

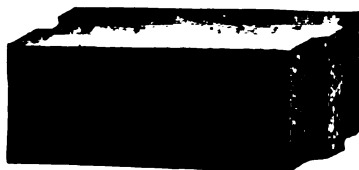
Fire Hazard

Not the least of the remarkable qualities of Redwood is its great resistance to fire. This combined with the slow burning construction of Rodd Redwood floors make it an extremely safe floor.



LOCKBLOSS—E

Cut from 4 x 6-in. stock. S4S to 3 3/4 x 5 1/2 in. Matched, tongued and grooved. Variation in width and depth not to exceed 1/16 in.



LOCKBLOSS—F

Cut from 2 x 6-in. stock. S4S to 1 1/2 x 5 1/2 in. Matched, tongued and grooved. Variation in width and depth not to exceed 1/16 in.

Maintenance and Repairs

The unit construction of Rodd Redwood floors make alterations or repairs a very simple matter.

Resurfacing Old Floors

The problem of repaving or replacing old floors is constantly before the architect and industrial engineer. With Redwood blocks and Rodd methods of construction such repairs can be easily accomplished. For example, if it is a question of an old concrete floor. The surface can be brought to a uniform level with a cushion of Creolignum mastic cement, and the Redwood blocks of the proper thickness bedded firmly therein. The entire surface can then be sanded smooth, and varnished if desired. Other conditions can be equally well met.

The architects or owner in reaching their decision should consider first the wonderful qualities of California Redwood, and the special methods of seasoning and manufacture used by The Pacific Lumber Company at their mills at Scotia. Then, as it is only with proper utilization of these qualities and sound construction methods that the best results can be obtained, assure themselves that a sound and experienced organization will perform and complete the work.

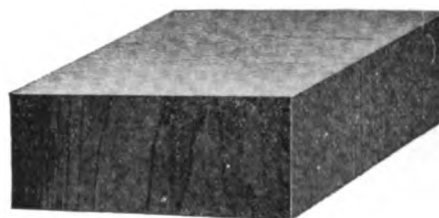
We have tried to make it clear that Redwood is not only suitable for heavy duty floors, but for textile mills, factories, department stores, pressrooms, hospitals, dairies, produce warehouses, office buildings, etc. where heretofore no wood block floor has given complete satisfaction, due to certain fundamental weaknesses. Redwood floors are suitable anywhere where service and beauty at a reasonable cost are desired.

Creolignum Asphaltic Cement

This material is our own invention. It is used in waterproofing the base, and to form a strong permanent binding cushion in which to set the blocks. On some floors, where a dark color is no objection, Creolignum Asphaltic Cement is also used as a seal coat and joint filler on top of the blocks.

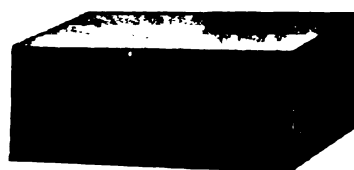
Creolignum Filler Paste and Creolignum Filler Varnish

Where a very smooth hard finish is required the complete floor is first scraped or sanded, then sealed with Creolignum Waterproofing Varnish. These ma-



RECTANGULAR BLOCKS—G

Cut from 4 x 6-in. stock. S4S to 3 3/4 x 5 1/2 in., or SISIE to 3 3/4 x 5 1/2 in. Variation in width and depth not to exceed 1/16 in.



RECTANGULAR BLOCKS—H

Cut from 2 x 6-in. stock. S4S to 1 1/2 x 5 1/2 in. or SISIE to 1 1/2 x 5 1/2 in. Variation in width and depth not to exceed 1/16 in.



REDWOOD BLOCK FLOORING IN CELLAR OF PALACE HOTEL, SAN FRANCISCO, CAL.

terials have been designed specially for Rodd Redwood blocks and can be furnished in any color.

Redwood Blocks of Highest Quality

The high quality of our blocks is guaranteed by The Pacific Lumber Company, the largest manufacturers and distributors of California Redwood. All our Redwood blocks are made in their mills at Scotia, California. We alone can furnish these quality blocks from these mills, in which every block is selected from the best stock, as well as being specially cured for flooring use in the Leaver Special Drying Kilns, a process of curing designed and patented by an officer of The Pacific Lumber Company, and held for its sole use.

Tested Under Unusual Conditions

Not only have Redwood blocks successfully stood over a quarter century of use in the Union Iron Works, where they are still in good condition, but The Pacific Lumber Company, itself, before offering to furnish us with blocks, has tested the utility and service of Redwood in its own large machineshops, where for years these Redwood blocks have been subject to usages seldom given in industrial plants, with the sole idea of determining exactly what service can be guaranteed.

We are authorized to state that The Pacific Lumber Company is prepared to supply the requirements that will now be forthcoming, and this assurance, combined with the guarantee of performance in laying good floors, which our years of experience justifies, should overcome any hesitancy on the part of architects, engineers, or owners of industrial plants.

A Service Organization

THE RODD Co. sells good floors—not floor materials. Our organization has furnished and installed floors for many of the leading railroad and industrial organizations of the country. Detailed information and estimates furnished on request. We invite inquiries.

Installation

No element of the finished floor is more important than the actual construction and the material used. The following specifications set forth clearly, and in detail, the methods to be followed.

We can undertake complete installations, or supply competent superintendents to oversee the work.

Specification No. 1. For Machineshops, Factories, Loading Platforms; Warehouses, Glass Factories, Linoleum Mills, Rubber Factories, etc.

(1) Material—

Blocks shall be manufactured from air seasoned, kiln dried, Redwood Lumber. They shall be uniform, close grained, and of a size and design specifically recommended by THE RODD COMPANY for the particular condition.

(2) Handling—

All blocks shall be shipped from the plant in sealed box cars, affording complete protection from the weather.

(3) Concrete Base—

A concrete base 4 to 6 in. thick, depending on the service, shall be installed and finished to a uniform and level surface with a wooden float.

(4) Creolignum Cushion—

Upon the concrete base spread a heavy coat of "Creolignum," Grade A (Heavy), taking care that the entire surface is covered.

(5) Laying Blocks—

The blocks shall be laid in straight parallel lines, breaking joints not less than 2 in. Every six to eight courses the blocks shall be carefully and thoroughly rammed in both directions to insure tight and even joints.

(6) Inspection—

The inspector, or superintendent of the work, shall go over the same immediately after they are installed, mark such blocks as are not in accordance with specification and correct any other errors which may have occurred.

(7) Creolignum Seal Coat—

On the surface of the entire floor spread a heavy squeegeed coat of "Creolignum," Grade B (Medium), thoroughly working all excess material into the joints.

(8) Sanding—

The entire floor shall then be covered with clean, dry, sharp sand, and allowed to remain for at least 2 weeks.

ALTERNATES FOR LIGHT COLORED FLOORS

Where light colored floor is desired, eliminate sections 7 and 8, or substitute the following:

(7) (Alternate) Creolignum Filler—

On the surface of the entire floor spread a heavy brush or squeegeed coat of "Creolignum" Paste Filler, working all excess into the joints, and allow to dry at least 24 hours.

(8) (Alternate) Creolignum Varnish—

After the filler coat has thoroughly dried, finish the entire floor with a thin brush coat of "Creolignum" Varnish. A second coat may be applied if desired. Allow to dry thoroughly before putting the floor into service.

Specification No. 2. For Textile Mills, Pressrooms, Food Products, Condensed Milk Factories, Paper Storage, Packing Houses, Refrigerating Plants, Ice Cream Plants

(1) Material—

Blocks shall be manufactured from air seasoned, kiln dried, Redwood Lumber. They shall be uniform, close grained, and of a size and design specifically recommended by THE RODD COMPANY for the particular condition.

(2) Handling—

All blocks shall be shipped from the plant in sealed box cars, affording complete protection from the weather.

(3) Concrete Base—

A concrete base 4 to 6 in. thick, depending on the service, shall be installed and finished to a uniform and level surface with a wooden float.

(4) Creolignum Cushion—

Upon the concrete base spread a heavy coat of "Creolignum," Grade A (Heavy), taking care that the entire surface is covered.

(5) Laying Blocks—

The blocks shall be laid in straight parallel lines, breaking joints not less than 2 in. Every six to eight courses the blocks shall be carefully and thoroughly rammed in both directions to insure tight and even joints.

(6) Inspection—

The inspector, or superintendent of the work, shall go over the same immediately after they are installed, mark such blocks as are not in accordance with the specification and correct any other errors which may have occurred.

(7) Scraping—

The entire floor shall be scraped or ground to a perfectly smooth surface, by hand or with a suitable machine.

(8) Creolignum Filler—

On the surface of the entire floor spread a heavy brush or squeegeed coat of "Creolignum" Paste Filler, working all excess into the joints, and allow to dry at least 24 hours.

(9) Creolignum Varnish—

After the filler coat has thoroughly dried, finish the entire floor with a thin brush coat of "Creolignum" Varnish. A second coat may be applied if desired. Allow to dry thoroughly before putting the floor into service.

Specification No. 3. For Department Stores, Hospitals, etc.**(1) Material—**

Blocks shall be manufactured from air seasoned, kiln dried, Redwood Lumber. They shall be uniform, close grained, and of a size and design specifically recommended by THE RODD COMPANY for the particular condition.

(2) Handling—

All blocks shall be shipped from the plant in sealed box cars, affording complete protection from the weather.

(3) Concrete Base—

A concrete base 4 to 6 in. thick, depending on the service, shall be installed and finished to a uniform and level surface with a wooden float.

(4) Creolignum Cushion—

Upon the concrete base spread a heavy coat of "Creolignum," Grade A (Heavy), taking care that the entire surface is covered.

(5) Laying Blocks—

The blocks shall be laid in straight parallel lines, breaking joints not less than 2 in. Every six to eight courses the blocks shall be carefully and thoroughly rammed in both directions to insure tight and even joints. The entire surface shall then be carefully rolled or tamped to a uniform level.

(6) Inspection—

The inspector, or superintendent of the work, shall go over the same immediately after they are installed, mark such blocks as are not in accordance with the specification and correct any other errors which may have occurred.

(7) Scraping—

The entire floor shall be scraped or ground to a perfectly smooth surface, by hand or with a suitable machine.

(8) Creolignum Filler—

On the surface of the entire floor spread a heavy brush or squeegeed coat of "Creolignum" Paste Filler, working all excess into the joints, and allow to dry at least 24 hours.

(9) Creolignum Varnish—

After the filler coat has thoroughly dried, 2 to 3 coats of "Creolignum" Varnish shall be carefully applied to the entire surface, ample time being given between coats to permit each coat to thoroughly dry. If particularly fine finish is required, each preliminary coat of "Creolignum" Varnish shall be rubbed before the application of the next coat.

Specification No. 4. For Installing Blocks on Joist and Plank Floors**(1) Material—**

Blocks shall be manufactured from air seasoned, kiln dried, Redwood lumber. They shall be uniform, close grained, and of a size and design specifically recommended by THE RODD COMPANY for the particular condition.

(2) Handling—

All blocks shall be shipped from the plant in sealed box cars, affording complete protection from the weather.

(3) Cushion and Seal—

Upon subplank floor spread a heavy brush coat of "Creolignum," Grade A (Heavy); spread thereon 1 layer of slater's felt, two-ply, lapping joints at least 3 in. and applying Creolignum between each lap. A second coat of Creolignum, Grade A (Heavy), shall be applied on the slater's felt.

(4) Laying Blocks—

The blocks shall be laid in straight parallel lines, breaking joints not less than 2 in. Every six to eight



REDWOOD BLOCK FLOORING USED ON THE BALCONY OF THE LARGEST MACHINE SHOP ON THE PACIFIC COAST
130,000 sq. ft. used altogether

courses the blocks shall be carefully and thoroughly rammed in both directions to insure tight and even joints. The entire surface shall then be carefully rolled or tamped to a uniform level.

(5) Inspection—

The inspector, or superintendent of the work, shall go over the same immediately after they are installed, mark such blocks as are not in accordance with the specifications and correct any other errors which may have occurred.

(6) Creolignum Seal Coat—

On the surface of the entire floor spread a heavy squeegeed coat of "Creolignum," Grade B (Medium), thoroughly working all excess material into the joints.

(7) Sanding—

The entire floor shall then be covered with clean, dry, sharp sand, and allowed to remain for at least 2 weeks.

ALTERNATES FOR LIGHT COLORED FLOORS

Where light colored floor is desired, eliminate sections 6 and 7, or substitute the following:

(6) (Alternate) Creolignum Filler—

On the surface of the entire floor spread a heavy brush or squeegeed coat of "Creolignum" Paste Filler, working all excess into the joints, and allow to dry at least 24 hours.

(7) (Alternate) Creolignum Varnish—

After the filler coat has thoroughly dried, finish the entire floor with a thin brush coat of "Creolignum" Varnish. A second coat may be applied if desired. Allow to dry thoroughly before putting the floor into service.

Specification No. 5—Installing Blocks on Old Worn Plank Floors

(1) Material—

Blocks shall be manufactured from air seasoned, kiln dried, Redwood lumber. They shall be uniform, close grained, and of a size and design specifically recommended by THE RODD COMPANY for the particular condition.

(2) Handling—

All blocks shall be shipped from the plant in sealed box cars, affording complete protection from the weather.



REDWOOD BLOCK FLOOR RECENTLY LAID IN ONE OF THE LARGEST MACHINESHOPS ON THE PACIFIC COAST

(3) Calking—

All cracks and openings shall be carefully calked, and the openings closed and filled with "Creolignum" Mastic.

(4) Cushion and Seal—

Upon subplank floor spread a heavy brush coat of "Creolignum," Grade A (Heavy); spread thereon 1 layer of slater's felt, two-ply, lapping joints at least 3 in., and applying Creolignum between each lap. A second coat of "Creolignum," Grade A (Heavy), shall be applied on the slater's felt.

(5) Laying Blocks—

The blocks shall be laid in straight parallel lines, breaking joints not less than 2 in. Every six to eight courses the blocks shall be carefully and thoroughly rammed in both directions to insure tight and even joints. The entire surface shall then be carefully rolled or tamped to a uniform level.

(6) Inspection—

The inspector, or superintendent of the work, shall go over the same immediately after they are installed, mark such blocks as are not in accordance with the specifications and correct any other errors which may have occurred.

(7) Creolignum Seal Coat—

On the surface of the entire floor spread a heavy squeegeed coat of "Creolignum," Grade B (Medium), thoroughly working all excess material into the joints.

(8) Sanding—

The entire floor shall then be covered with clean, dry, sharp sand, and allowed to remain for at least 2 weeks.

ALTERNATES FOR LIGHT COLORED FLOORS

Where light colored floor is desired, eliminate sections 7 and 8, or substitute the following:

(7) (Alternate) Creolignum Filler—

On the surface of the entire floor spread a heavy brush or squeegeed coat of "Creolignum" Paste Filler, working all excess into the joints, and allow to dry at least 24 hours.

(8) (Alternate) Creolignum Varnish—

After the filler coat has thoroughly dried, finish the entire floor with a thin brush coat of "Creolignum" Varnish. A second coat may be applied if desired. Allow to dry thoroughly before putting the floor into service.

Specification No. 6—For Resurfacing Worn Concrete Floors with Blocks

(1) Material—

Blocks shall be manufactured from air seasoned, kiln dried, Redwood lumber. They shall be uniform, close grained, and of a size and design specifically recommended by THE RODD COMPANY for the particular condition.

(2) Handling—

All blocks shall be shipped from the plant in sealed box cars, affording complete protection from the weather.

(3) Cushion—

On the concrete base spread a cushion of "Creolignum" Mastic sufficient to take up all unevenness, and form a uniform base for the blocks.

(4) Laying Blocks—

The blocks shall be laid in straight parallel lines, breaking joints not less than 2 in. Every six to eight courses the blocks shall be carefully and thoroughly

rammed in both directions to insure tight and even joints. The entire surface shall then be carefully rolled or tamped to a uniform level.

(5) Inspection—

The inspector, or superintendent of the work shall go over the same immediately after they are installed, mark such blocks as are not in accordance with the specification and correct any other errors which may have occurred.

(6) Creolignum Seal Coat—

On the surface of the entire floor spread a heavy squeegeed coat of "Creolignum," Grade B (Medium), thoroughly working all excess material into the joints.

(7) Sanding—

The entire floor shall then be covered with clean, dry, sharp sand, and allowed to remain for at least 2 weeks.

ALTERNATES FOR LIGHT COLORED FLOORS

Where light colored floor is desired, eliminate sections 6 and 7, or substitute the following:

(6) (Alternate) Creolignum Filler—

On the surface of the entire floor spread a heavy brush or squeegeed coat of "Creolignum" Paste Filler, working all excess into the joints, and allow to dry at least 24 hours.

(7) (Alternate) Creolignum Varnish—

After the filler coat has thoroughly dried, finish the entire floor with a thin brush coat of "Creolignum" Varnish. A second coat may be applied if desired. Allow to dry thoroughly before putting the floor into service.

Specification No. 7—For Bridges, and Paving on Concrete Base

(1) Material—

Blocks shall be manufactured from air seasoned, kiln dried, Redwood lumber. They shall be uniform, close grained, and of a size and design specifically recommended by THE RODD COMPANY for the particular condition.

(2) Concrete Base—

A concrete base 6 to 8 in. thick depending on the service shall be installed and finished to a uniform and level surface with a wooden float.

(3) Creolignum Cushion—

Upon the concrete base spread a heavy coat of "Creolignum," Grade A (Heavy), taking care that the entire surface is covered.

(4) Laying Blocks—

The blocks shall be laid hand-tight in straight parallel lines, breaking joints not less than 2 in. The entire surface shall then be carefully rolled or tamped to a uniform level.

(5) Inspection—

The inspector, or superintendent of the work, shall go over the same immediately after they are installed, mark such blocks as are not in accordance with the specifications and correct any other errors which may have occurred.

(6) Sanding—

On the surface of the blocks spread a layer of clean, dry sand, carefully sweeping it into all joints and openings. Clean all the remaining sand from the surface.

(7) Creolignum Seal Coat—

On the surface of the entire pavement spread a heavy squeegeed coat of "Creolignum," Grade B (Me-



REDWOOD BLOCK FLOORING LAID IN THE AMERICAN CAN COMPANY'S SHOPS, OAKLAND, CAL.

Total area of Redwood block flooring, 45,000 sq. ft.

dium), thoroughly working all excess material into the joints.

(8) Final Sanding—

The entire pavement shall then be covered with clean, dry sharp sand, and allowed to remain for at least 2 weeks.

Specification No. 8—For Bridges, Plank Subfloors

(1) Material—

Blocks shall be manufactured from air seasoned, kiln dried, Redwood lumber. They shall be uniform, close grained, and of a size and design specifically recommended by THE RODD COMPANY for the particular condition.

(2) Cushion and Seal—

Upon subplank floor spread a heavy brush coat of "Creolignum," Grade A (Heavy)), and spread thereon 1 layer of slater's felt, two-ply, lapping joints at least 3 in. and applying Creolignum between each lap. A second coat of "Creolignum," Grade A (Heavy), shall be applied upon the slater's felt.

(3) Laying Blocks—

The blocks shall be laid hand-tight in straight parallel lines, breaking joints not less than 2 in. The entire surface shall then be carefully rolled or tamped to a uniform level.

(4) Inspection—

The inspector, or superintendent of the work shall go over the same immediately after they are installed, mark such blocks as are not in accordance with the specification and correct any other errors which may have occurred.

(5) Sanding—

On the surface of the blocks spread a layer of clean, dry sand, carefully sweeping it into all joints and openings. Clean all the remaining sand from the surface.

(6) Creolignum Seal Coat—

On the surface of the entire floor spread a heavy squeegeed coat of "Creolignum," Grade B (Medium), thoroughly working all excess material into the joints.

(7) Final Sanding—

The entire floor shall then be covered with clean, dry, sharp sand, and allowed to remain for at least 2 weeks.

SOUTHERN WOOD PRESERVING COMPANY

ATLANTA, GA.

BRANCH OFFICES

PITTSBURGH, PA., 600 Dollar Savings & Trust Building

TOLEDO, OHIO, Spitzer Building

Products

CREO-PINE WOOD FLOOR BLOCKS.

Also Creo-pine Sub-flooring, Wood Conduit, Cross Arms and Fence Posts.

Uses of Creo-pine Wood Floor Blocks

Creo-pine floor blocks are used in factories, machine-shops, warehouses, loading platforms and other establishments where durability is an essential factor and comfort to workmen, and consequent increased human efficiency are items of consideration.

Qualifications of a Good Floor

- (1) It should withstand surface wear and afford a smooth surface.
- (2) It should be resilient, free from vibration, non-conductive of heat and non-slippery.
- (3) It should not dust or crumble.
- (4) It should be sanitary and easy to clean.
- (5) It should adapt itself readily to repairs not only to the surface but to sub-floor work.
- (6) It should be impervious to decay and the action of oils, acids, etc.

Creo-pine

TRADE-MARK

Determining Factors of a Good Floor

- (1) Blocks shall be made of select southern yellow pine.
- (2) They shall be manufactured with mechanical precision to the proper size for service required.
- (3) They shall be impregnated with creosote oil in accordance with standard specifications.
- (4) They shall be correctly installed.

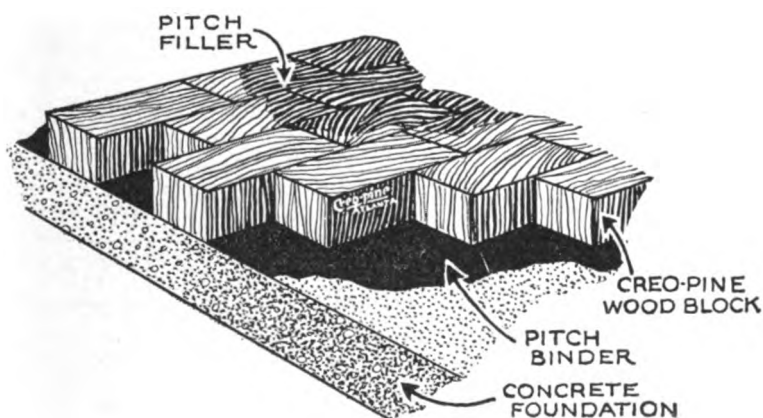
Creo-pine Floors Conform to the Ideal

Creo-pine floors meet the above qualifications, as the foregoing determining factors are embodied in each finished floor. The lumber used is the best obtainable southern yellow pine, thoroughly air seasoned.

Blocks are carefully manufactured to correct size for service required and impregnated with creosote oil by the use of the most modern wood preserving equipment. The creosote used is obtained wholly from pure coal tar and is in accordance with standard specifications.

The installation is handled by experienced superintendents.

Further information and estimates gladly furnished on request.



METHOD OF INSTALLING CREO-PINE WOOD FLOOR BLOCKS



CREO-PINE WOOD BLOCK FLOOR IN PLANT OF PACKARD MOTOR CO.

E. N. BIEGLER MANUFACTURING CO.

Mas-Oleum Mastic and Kork-Oleum Composition Floors and Cove Base;
Bag-Oleum Ready Mix Floors; Asphalt Floors and Plastic Tile

GENERAL OFFICES AND FACTORY

TELEPHONE
HUMBOLDT 0135

2728-2736 North Rockwell Street and C. & N. W. R. R.
CHICAGO, ILL.

Products and Services

MAS-OLEUM MASTIC FLOORING and COVE BASE.

KORK-OLEUM MAGNESITE COMPOSITION SANITARY FLOORING and COVE BASE.

BIEGLER'S BAG-OLEUM READY MIX, a Fibrous, Fireproof Colored Aggregate for Cement Floors.

BIEGLER'S NON-SLIP PLASTIC TILE.

BIEGLER'S ROCK-ASPHALT FLOORING.

Contracts executed anywhere or materials furnished with instructions, if desired. Specifications, samples and quotations furnished on request with recommendation covering the practical floor for existing conditions.

Quality and Adaptability

When quality is considered we do not fear any competition.

We maintain there is not one floor practical for every purpose.

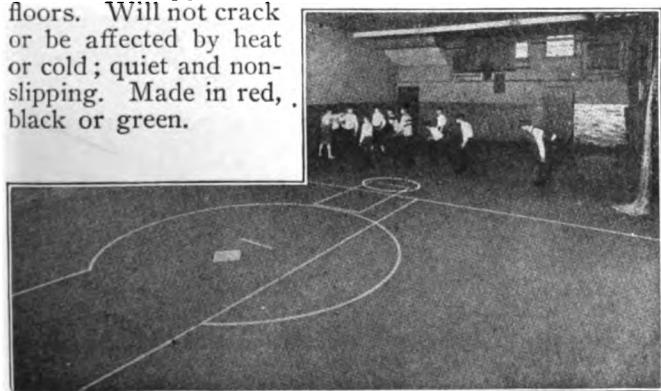
Many owners, architects and contractors have testified to the merits of our products. Kindly give us an opportunity to serve you at our expense.

Biegler's Mas-Oleum Flooring

A mineral rubber plastic compound, resilient, acid and waterproof in its qualities and a non-conductor of electricity.

Laid in 5 or more coats from $\frac{1}{8}$ in. upward in thickness at a small initial cost and a minimum maintenance expense. Any ordinary workman can lay or repair same.

Can be applied over old or new cement finished floors. Will not crack or be affected by heat or cold; quiet and non-slipping. Made in red, black or green.



MAS-OLEUM MASTIC NON-SLIP FLOORING APPLIED IN Y. M. C. A. GYMNASIUM, CHICAGO, ILL.

Biegler's Kork-Oleum Flooring

A magnesite sanitary, fireproof composition flooring, laid over concrete or old wood floors. Usually laid $\frac{1}{2}$ in. thick in 2 coats: $\frac{1}{4}$ in. cushion coat, and $\frac{1}{4}$ in. finish or top coat in various colors and panel effect. Cove base and border to suit any combination desired.

Sanitary and effective features stamp Kork-Oleum floors as most practical when price and quality are considered.



Kork-Oleum composition is a combination of asbestos, pulverized cork, coloring matter, oxychloride and other fireproof minerals, mechanically mixed at our factory with approved machinery. Delivered to the job ready for laying by our own

skilled mechanics or under our supervision.

The floor is laid monolithic and fully guaranteed, especially adapted for wainscoting, cove base and stair treads.

Biegler's Bag-Oleum Ready Mix

An aggregate to be mixed with cement, torpedo sand, marble or granite chip, equal to torpedo sand mesh. A 1:1:1 mix—that is, 1 part Bag-Oleum, 1 part portland cement and 1 part any of the 3 stone minerals: torpedo sand, marble or granite chip. Creates and produces a colored cement plastic finish at a very small expense. Quickly mixed and laid, making it possible for the cement contractor on job to complete work, including finished floor, without delay to building.

Bag-Oleum is a wonderful floor discovery, as it eliminates delay to occupancy.

It is mixed as cement in a cement mixer or mortar box and finished by trowel, the same as sidewalks. Can also be used as wainscoting and sanitary base and lined off as tile effect.

Furnished in red, black, gray, buff, brown, green or any special color desired.

Biegler's Non-slip Plastic Tile

Used for creating an effective design in either squares or hexagons. Furnished in either Mas-Oleum mastic $\frac{1}{4}$ in. and upward in thickness, or Kork-Oleum composition $\frac{3}{4}$ in. and upward. Can be had in any color, size or style desired.

Biegler's Rock-Asphalt Flooring

Applied hot, in thickness from $\frac{1}{2}$ in. upward over old or new cement or wood floors. Furnished in dark red or green.

Further Information

Practical suggestions as to color effects, sizes of tile or panels, furnished according to the sizes of areas contemplated.

We have agents in principal cities who can call on you personally and furnish any further information desired on any of our products.

Guarantee

All of our materials and workmanship are fully guaranteed, backed by responsibility and 25 years' practical experience as manufacturers and contractors in our line. We can refer to millions of feet of installations of our various floors throughout the United States that will bear their own references; among them some of the largest industrial plants, office buildings, hospitals, schools and United States Federal buildings.

THE MARBLELOID COMPANY

Manufacturers of and Contractors for Magnesite Products

461 Eighth Avenue at Thirty-fourth Street
NEW YORK, N. Y.

FACTORY, NEW DURHAM, N. J.

BRANCH OFFICES

*PITTSBURGH, PA., 6624 Hamilton Avenue
*PHILADELPHIA, PA., 1524 Chestnut Street
*CLEVELAND, OHIO, 528 Erie Building
*DETROIT, MICH., 1333 Dime Bank Building
*BOSTON, MASS., 200 Devonshire Street
MONTREAL, CANADA, 908 New Burks Building

CINCINNATI, OHIO, 507 Mercantile Library Building
NORFOLK, VA., 905 National Bank of Commerce Building
KNOXVILLE, TENN., 407 Burwell Building
WASHINGTON, D. C., 1121 Vermont Avenue
MINNEAPOLIS, MINN., 1115 Metropolitan Life Building
ST. LOUIS, MO., 1723 Missouri Avenue

Products

"MARBLELOID" FIREPROOF PLASTIC FLOORING, a Magnesite Composition for Floors, Coved Sanitary Base, Wainscot, Trim, Treads, etc.

Marbleloid Flooring

Physical Characteristics, Properties and Advantages—Marbleloid is a sanitary, standardized, permanent, light weight, fireproof and resilient composition. It is installed in a plastic state, $\frac{1}{2}$ in. thick, and sets in a few hours into a seamless, tough, elastic body, presenting a fine grained, smooth surface.

The fact that it is jointless, remarkably free from a tendency to crack and practically non-absorbent gives it unusual sanitary value. It is easily kept clean; it is quiet to the tread; it is non-dusting, offering high resistance to abrasion; it is not slippery. Owing to its elasticity, it is not fatiguing; it is a non-conductor of heat and, therefore, never cold; it has great crushing and structural strength and does not contract nor expand to any appreciable degree.

Marbleloid adheres firmly to wood, concrete or iron, and may be installed over old flooring, base or wainscot, as well as upon new construction. It is made in all colors, offering possibilities in the working out of any desired color scheme. Only inert mineral colors are used.

Adaptability—Marbleloid has been in use for the past seventeen years and is constantly being installed in almost every type of building. Because of the advan-

tages enumerated, it is used to a very large extent in offices, institutions, schools, public buildings, churches, restaurants, clubs, hotels, theaters, libraries, banks, industrial plants, residences, apartment houses, laboratories, stores, garages, and in railroad cars, railroad stations, and steamships. Approximately 2,000,000 sq. ft. of Marbleloid are annually installed in the United States and Canada.

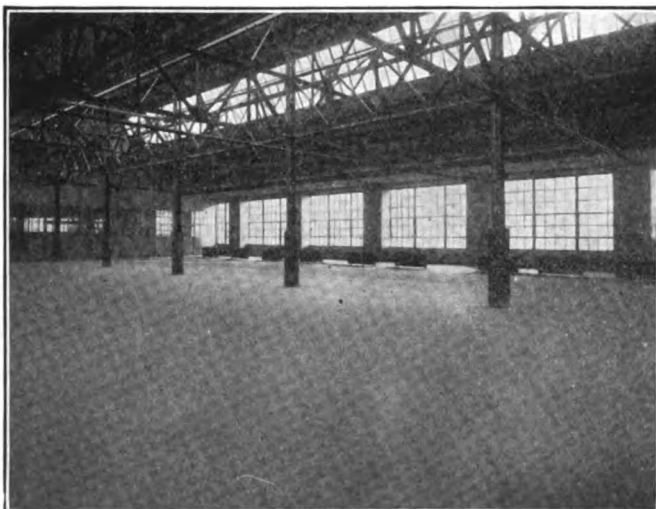
Physical Tests—Marbleloid weighs approximately 3 lbs. to the sq. ft.; it has a very low percentage of absorption; its compressive strength is over 6000 lbs. per sq. in.; it has a tensile strength of from 800 to 1100 lbs. per sq. in.

It has great resistance to abrasion and will stand under light trucking.

Marbleloid has been tested and approved by the Bureau of Buildings, Borough of Manhattan, New York City, as *fireproof material*. Copies of this report and other physical tests made by Prof. Woolson at Columbia University may be had on request.

Marbleloid Service—THE MARBLELOID COMPANY maintains thoroughly trained and skilled workmen at the principal building centers of the country and is, therefore, unusually well equipped to perform work in any section with its usual high standard of excellence.

Owing to the fact that installations are unsuccessful when made by local cement masons, inexperienced in the handling of material of this nature, Marbleloid flooring is not sold in bulk. *All work is installed by the Marbleloid organization and is rigidly guaranteed.*



INTERIOR EVENING NEWS BUILDING, DETROIT, MICH.
ALBERT KAHN, Architect

*Indicates warehouse.



MARBLELOID INSTALLED THROUGHOUT OFFICE OF AMERICAN
PULLEY COMPANY, PHILADELPHIA, PA.
HEACOCK & HOKANSON, Architects

Before actually beginning the installation of the Marbleloid material, a preliminary inspection is made by an engineer thoroughly familiar with all phases of building construction.

At the plant and in the field, Marbleloid facilities are such that the company is always prepared to handle all work, no matter how large, with the utmost dispatch and efficiency.

In order to maintain the superior merit of its product, THE MARBLELOID COMPANY carefully tests all raw materials before acceptance at the factory. All shipments which do not come within the Marbleloid standard are rejected. The laboratory is equipped to make both chemical analyses and complete standard physical tests.

Relative Low Cost—Marbleloid is a permanent flooring which requires no unusual or expensive foundation. It may be put into service 24 hours after it has been installed. It may be used just as readily over wood flooring (finished or sub-floor) as it can be over concrete fill or finished cement sub-floor. Thus in alteration work both the time and expense of the preparation of a special foundation may be eliminated. In the larger areas it costs a little less than the best grade of hardwood flooring and but a little more than linoleum—Marbleloid outwearing many applications of the latter.

Marbleloid Specifications

Before drawing up specifications covering the use of Marbleloid, the company suggests that engineers or architects secure a copy of this company's Standard Specification Sheet. This Specification Sheet contains foundation requirements and other data that is essential for securing satisfactory results.

The price of Marbleloid flooring, sanitary coved base, wainscoting, stair work, etc., varies, naturally, with the area involved, nature of the foundation (wood, concrete, or iron) and location. With crews of Marbleloid mechanics in the various building centers of the country, economy and efficiency are assured.

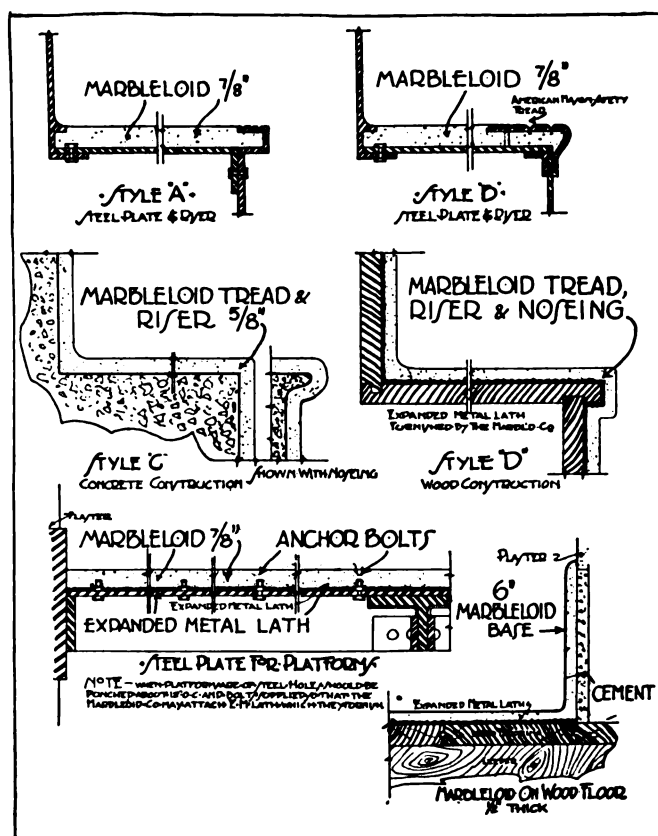
Upon receipt of data giving information regarding nature of foundation, the area of floor and wainscot, lineal extent of sanitary base, treads, etc., a definite proposal for the work completely installed will be furnished.

Guarantee

The Marbleloid Company rigidly guarantees the quality of its material and all work performed by its workmen, and will repair, free of charge, all defects due to the use of improper materials or workmanship.



MARBLELOID FLOOR INSTALLED IN CAFETERIA OF STUDEBAKER PLANT, SOUTH BEND, IND.



SECTIONS SHOWING METHOD OF APPLICATION OF MARBLELOID IN DIFFERENT TYPES OF CONSTRUCTION

Samples, etc.

Samples and color card, together with full literature including booklet, Standard Specification, etc., will be gladly mailed on request.

References

As an indication of the merits of Marbleloid flooring, a portion of a list, giving the names of nationally known corporations for whom repeated installations of this material have been placed, is printed below:

FIRM	CONTRACTS	FIRM	CONTRACTS
Bethlehem Steel Co.....	12	General Electric Co.....	20
Carnegie Steel Co.....	26	Metropolitan Stores, Inc....	17
Crucible Steel Co.....	12	New Jersey, State of.....	19
Frankford Arsenal.....	14	New York, City of.....	55
General Chemical Co.....	9	New York Edison Co.....	19



INSTALLATION OF MARBLELOID FLOORING WITH SANITARY COVED BASE UNDER WAY AT CHEVROLET PLANT, FLINT, MICH.

GENERAL KOMPOLITE CO.

Composition Floors and Wainscots, Mastic Floors, Plastic Floor Compounds
Calciners and Grinders of Magnesite

TELEPHONE
HUNTERS POINT 5361, 5362

325-327 Borden Avenue
LONG ISLAND CITY, N. Y.

Products

"KOMPOLITE," a Monoplastic, Sanitary, Seamless Composition Floor and Wainscot.

"MASTOLITH," a Mastic, Plastic Flooring.

"Kompolite"

"Kompolite" is a magnesium asbestos composition made in many attractive colors. It is sanitary, seamless, fireproof, sound deadening, water repelling, easy under foot, germproof and dustproof. For heavy service and hard wear. Applied in plastic form on concrete, wood or iron, in new or old buildings.

It is light in weight, so that it can be used on weak structures where heavier material can not be employed. It is in daily use in places where wood, cement, asphalt, concrete, slate, marble, etc., have not been satisfactory.

Sixteen years of successful application and millions of feet of it in daily satisfactory use attest to the value of "Kompolite."

It has proved wonderfully durable under the most severe conditions. A floor now in use nearly 13 years, over which loads of 2 to 4 tons are drawn and sharp shod horses are driven, shows hardly any sign of wear. Another floor, over which 60,000 to 80,000 people have passed each day, has been in uninterrupted use for over 9 years.

Nearly 250,000 ft. of "Kompolite" have been installed in a public institution and after almost 6 years of use not a single foot was removed, repaired or relaid because of defective or unsatisfactory material or workmanship. After 2 years of test and service and in comparison with many other composition floors, "Kompolite" was accepted by the architects of the Grand Central Terminal, New York, and is the only composition floor laid in that great railroad station.

After careful, scientific test and numerous experiments by the Bureau of Standards, Washington, "Kompolite" was installed in many of the United States Post Offices, Government Printing Offices, the Capitol of the United States and other public buildings.

"Kompolite" has been laid in fine residences, tenements, hotels, restaurants, factories, stores, railroad stations, hospitals, schools, churches, office and loft

buildings, theaters, clubs, etc. In all it has been satisfactory.

Every foot is guaranteed by a contract which has never been questioned and has always been carried out to the satisfaction of architect, contractor or owner.

"Kompolite" is specified by leading architects, indorsed by noted contractors, and approved by property owners as the solution of many floor troubles.

Being calciners and grinders of magnesite this company can guarantee the quality of the most important materials used in every composition floor installation.

"Mastolith"

"Mastolith" is a plastic, seamless surface made from mineral gum with vulcanized oil and asbestos fiber. It has the advantages of light grade battleship linoleum without any of its disadvantages.

It is furnished in a medium red, chocolate brown and dark gray, laid $\frac{1}{8}$ in. to $\frac{3}{8}$ in. thick. It sets rapidly and may be used for foot traffic within 24 hours.

"Mastolith" is waterproof and is not affected by foot usage or trucks in warehouses.

It deadens noise and is agreeable to the tread.

It is absolutely sanitary and non-absorbent.

It will not crack or loosen from the underflooring.

It can be repaired perfectly with little trouble.

It retains its elasticity and always presents an attractive appearance.

"Mastolith," used as a covering, bonds excellently to concrete or wood floors, either old or new, concrete roofs, porches, walks, stair treads, or is used to protect concrete floors from dusting or from wear.

It forms an ideal floor for schools, churches, hospitals, asylums, jails, and for theaters, restaurants and all public or private buildings.

References

"Kompolite" and "Mastolith" have been subjected to most severe tests in practical use. References will be given to architects, engineers, or contractors to prove that "Kompolite" and "Mastolith" are the most reliable and, quality considered, the most moderate priced monoplastic floors and wainscots now made.

ESTABLISHED 1870

FULTON ASPHALT COMPANY

Manufacturers of Asphalt Mastic Floors

Monadnock Block
CHICAGO, ILL.

PLANTS: CLEARING, ILL., AND CHICAGO, ILL.

Products

ASPHALT MASTIC FLOORS.
ACIDPROOF MASTIC FLOORS.
Also manufacturers of:
Fulton 1870 Brand Asphalt Mastic.
Fulton 1870 Brand Acidproof Mastic.
Fulton 1870 Brand Waterproofing Mastic.
Fulton 1870 Brand Pure Asphalts.
Fulton 1870 Brand Asphalt Paints.

Fulton Service

Over 50 years of experience and service in the manufacture and installation of asphalt and acidproof mastic floors in all types of building construction throughout the country, have given us the practical knowledge and ability necessary to efficiently and correctly install this type of flooring to meet all conditions. Pure asphalts, specially manufactured to meet each individual flooring condition, installed by expert mechanics who have laid this particular type of floor for 25 years or more, insure the engineer or owner of the best quality of workmanship and materials obtainable.

Floors installed in all parts of the United States and Canada.

Uses of Asphalt and Acidproof Mastic Floors

The practical flooring for the following types of buildings:

Railroad passenger and freight terminals,
Manufacturing plants and machineshops,
Rubber plants, paper and textile mills,
Garages and stables,
Warehouses and cold storage plants,
Chemical, acid, plating, engraving, battery and dye plants, vinegar, preserving, pickle and yeast plants,
Dairies and ice cream plants,
Schools and colleges.

Advantages and Adaptability of Asphalt Mastic Floors

Asphalt mastic floors are unsurpassed for their durable, resilient, waterproof, sanitary, fireproof, dustless and noiseless qualities.

Our installations in place for the last 25 years are giving excellent service today without maintenance, under conditions which other types of flooring have failed to withstand.

Heavy trucking does not grind or wear the surface of this floor.

There are no joints or cracks for liquids to lodge in, hence its waterproof and sanitary qualities.

All the above qualities combine to make this flooring the best as well as the lowest priced, measuring cost per year of service, that can be laid.

Acidproof Mastic Floors

In addition to having all of the excellent and necessary qualities of a satisfactory flooring, this type of floor is proof against all commercial, fruit and vinegar acids.

Installation

Both types of mastic floors are successfully installed over wood or concrete base in new or old buildings by our expert mechanics.

Guarantee

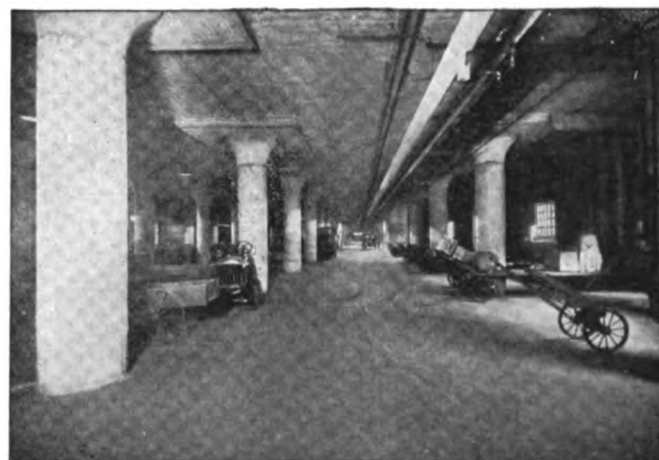
All work is guaranteed by us to give the service for which it is installed.

Specifications

Specifications, sample, full details and information gladly furnished on request.



ST. PAUL UNION PASSENGER TERMINAL, ST. PAUL, MINN.
W. C. ARMSTRONG, Chief Engineer



BAGGAGE ROOM, ST. PAUL UNION PASSENGER TERMINAL
Asphalt Mastic floors throughout mail, baggage, express and milk departments

THE HASTINGS PAVEMENT COMPANY

TELEPHONE
BROAD 1496

25 Broad Street
NEW YORK, N. Y.

WORKS
HASTINGS-ON-HUDSON, N. Y.

Products

COMPRESSED ASPHALT FLOORING and PAVING BLOCKS.

Asphalt Blocks

A scientifically manufactured material for the wearing surface of streets and roads, and of piers, warehouses, loading platforms, factory floors, bridges, driveways, courtyards, etc.

Manufactured at a large permanent plant; shipped in block form ready to lay; and always obtainable in any quantity for extension and repairs.

Composition—A properly proportioned mixture of natural asphalt, crushed rock and limestone dust is heated to 300° Fahr., and shaped into uniform blocks under a pressure of 6000 lbs. per sq. in.

SIZES AND WEIGHTS

Width, in.	Length, in.	Depth, in.	Weight, lbs.
5	12	2	11
5	12	2½	13½
4	8	1¼	3½ ("Eightfours")

A square foot of 2-in. block weighs 26 lbs.
A square foot of 1¼-in. "Eightfours" weighs 15½ lbs.
The specific gravity of asphalt block is 2.40.

"Eightfour" Blocks

The "Eightfour" asphalt flooring block is designed especially to meet those conditions in which weight and thickness of flooring must be at a minimum consistent with durability under heavy traffic. The "Eightfour" is also suitable for roofs subject to traffic.

Advantages—Asphalt blocks are pleasing in appearance; smooth, noiseless, dustless, warm and easy under foot; sanitary, because non-absorbent; and next to granite, the most durable. They present a gritty, non-slippery, non-skiddable surface, and are easily taken up and relaid. They are non-expansive, odorless and free from exudations; and are not affected by standing loads, extremes of temperature, or by automobile oils. They are reasonable in cost, and are made to suit any climate and traffic conditions.

Method of Laying—Upon the surface of the concrete foundation there is spread a bed of portland cement mortar ½ in. thick, which is struck to a true and even surface. Upon this bed the blocks are immediately laid, with close joints and uniform top surface, the joints being broken 4 in. After being laid, the blocks are given a light coat of sharp, fine sand, well broomed into the joints. The joints of the "Eightfours" are grouted. Traffic is permitted in 4 or 5 days.

References

MANUFACTURING PLANTS, ETC.

Quintard Iron Works, New York, N. Y.
Remington Arms Co., Bridgeport, Conn.
Otis Elevator Co., Harrison, N. J.
Westinghouse Electric & Mfg. Co., Essington, Pa.
United States Navy Yards: Brooklyn, N. Y.; Boston, Mass.; Washington, D. C.
United States Naval Supply Base, Brooklyn, N. Y.
United States Naval Operating Base, Hampton Roads, Va.
Scovill Manufacturing Co., Waterbury, Conn.
American Copper Products Corporation, Baway, Elizabeth, N. J.
Studebaker Corporation, South Bend, Ind.
Morgan Engineering Co., Alliance, Ohio
Standard Steel Works, Burnham, Pa.

PIERS

Bush Terminal Pier No. 6, Brooklyn, N. Y.
New York Dock Co. Piers Nos. 16, 18, 26 and 36, Brooklyn, N. Y.
Ocean Steamship Co., Piers, Savannah, Ga.
Pennsylvania Railroad Pier, Greenville, N. J.
Lamport & Holt Line Piers, Hoboken, N. J.
United States Army Supply Base Piers, Brooklyn, N. Y.
New York City Piers, Stapleton, Staten Island, N. Y.

LOADING PLATFORMS

Arbuckle Building, Brooklyn, N. Y.
B. R. & P. Warehouse, Rochester, N. Y.
United States Army Supply Base, Brooklyn, N. Y.

BRIDGES

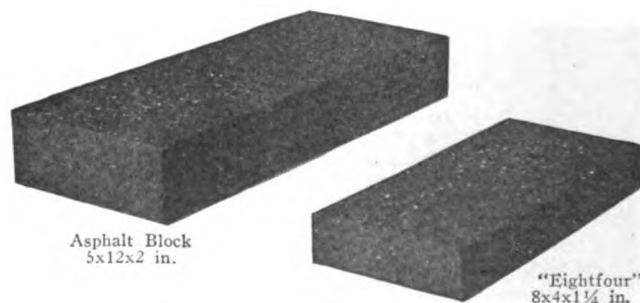
New York Central Railroad, New York & Westchester Co., N. Y.
Pennsylvania Railroad, Sunnyside Yards, New York, N. Y.
Long Island Railroad, Bay Ridge, Brooklyn, N. Y.

DRIVEWAYS AND COURTYARDS

Whitelaw Reid Residence, New York, N. Y.
Apthorp Apartments, New York, N. Y.
Greenwood Cemetery, Brooklyn, N. Y.
United Hospital, Port Chester, N. Y.
Biltmore Country Club, Rye, N. Y.
Cab Stand, Grand Central Station, New York, N. Y.

STREETS AND ROADS

Bronx and Pelham Parkway, New York, N. Y.
Albany Post Road, North Tarrytown, N. Y.
Boston Post Road, Rye, N. Y.
Bronx River Parkway Drive, Westchester Co., N. Y.
Nassau Street, Princeton, N. J.
Wyoming Avenue, Wyoming, Pa.
Broad Street, Richmond, Va.
Memorial Boulevard, Hillsborough Co., Fla.



COMPRESSED ASPHALT FLOORING AND PAVING BLOCKS

SCHILLINGER CONSTRUCTION CO.

SCHILLINGER BROS. FLOOR DIVISION

Manufacturers of and Contractors for Flooring, Insulation and Waterproofing

TELEPHONE
HUMBOLDT 0690

2319 North Seeley Avenue
CHICAGO, ILL.

Products and Services

ASPHALT and ACID RESISTING MASTIC FLOORS.

MAS-BLOCK PAVEMENTS.

MAS-TILE FLOORS.

LINO-MASTIC FLOORING.

ASBESTOLITHIC-TILE INSULATION.

ASBESTOLITHIC MASTIC (Acid Resisting).

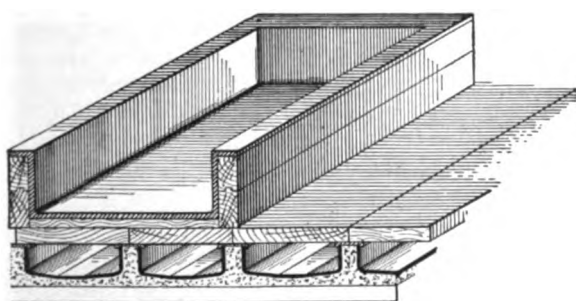
Also manufacturers of Composition (Magnesite) Floors; Waterproofing; Schillinger's Improved Floor Drains, cast iron and terra cotta.

Slogan

"35 Years Building Quality Floors."

Flooring

Asphalt and acid resisting floors are laid over concrete or wood base, new or old, in thickness of $\frac{1}{2}$ to 2 in. to conform with traffic conditions. Where drainage is required, same can be provided for in concrete base or by the installation of asphaltic concrete base.



SECTION OF ACID RESISTING FLOOR
Consisting of a series of gutters which act as underdrains. Note
Asbestolithic lining in tank

MAS-BLOCK pavements consist of hydraulically compressed asphalt mastic blocks, measuring 5x12x2 in. and



COMPRESSED ASPHALT MASTIC BLOCKS
FOR PAVEMENTS AND FLOORS

5x12x2 $\frac{1}{2}$ in. MAS-TILE floors consist of hydraulically compressed asphalt mastic tiles measuring 8x4x1 $\frac{1}{4}$ in. These blocks and tiles are laid over a 6-in. concrete base, are set in $\frac{1}{2}$ -in. mortar and require no expansion joints.

MAS-BLOCK pavements and MAS-TILE floors will not mar, are warm, non-slippery, resilient, non-absorbent, and are free from exudations, which is an important feature in the consideration of floors to be used in storage of food stuffs.

LINO-MASTIC flooring, $\frac{1}{8}$ to $\frac{1}{4}$ in. thick, is a durable, resilient, damp resisting floor which is built up of continuous fibrous sheets, treated with Schillinger's special process. Therefore LINO-MASTIC is 100% more durable and resilient and has longer life than other cold mastic floors. It can be laid on wood, concrete or steel.

Asbestolithic Mastic and Insulation

An acid resisting plastic material which is a sanitary and permanent covering for floors, stair treads, walls, ceilings, tank linings, spray sheds and condenser pans.

This material, when applied to walls and ceilings, acts as an insulator and is therefore very adaptable for refrigerators.

When very efficient insulation is required, this material is combined with 2-, 4- or 6-in. insulation tiles, which produces an insulation that has many advantages over cork insulation.

Specifications

Full detailed specifications of all of this company's products will be sent on request.

Recent Installations

U. S. Post Office, Detroit, Mich.
Soldiers' and Sailors' Home, Quincy, Ill.
Packard Motor Car Co., Pullman, Ill.
Chicago By-Products Co., Chicago, Ill.
B. & O. Freight Terminal, Chicago, Ill.
C. & A. Freight House, Chicago, Ill.
Rock Island Depot, Chicago, Ill.
Boulevard Dairy Co., Detroit, Mich.
Geller Dairy Co., Chicago, Ill.
Ira J. Mix Dairy Co., Chicago, Ill.
Corn Products Refining Co., Pekin and Argo, Ill.
Victor Chemical Co., Chicago Heights, Ill., and
Nashville, Tenn.
Western Clock Co., La Salle, Ill.
Lincoln Ice Co., Chicago, Ill.

STANDARD OIL COMPANY

(INDIANA)

Manufacturers of Paving Asphalt, Asphaltic Road Oils and Binders

910 South Michigan Avenue

CHICAGO, ILL.

OFFICES FOR QUOTATIONS, ORDERS AND GENERAL INFORMATION

CHICAGO, ILL.
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FARGO, N. D.

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INDIANAPOLIS, IND.
SOUTH BEND, IND.
WICHITA, KANS.
MINNEAPOLIS, MINN.

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MANKATO, MINN.
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SAGINAW, MICH.
DETROIT, MICH.
GRAND RAPIDS, MICH.
LA CROSSE, WIS.
MILWAUKEE, WIS.

Products

STANOLIND PAVING ASPHALT.
STANOLIND PAVING FILLER.
STANDARD PAVING FILLER.
ROOFING ASPHALTS.
SATURATING ASPHALTS.
BRIQUETTING ASPHALTS.
FLUXING ASPHALTUMS.
ASPHALTIC ROAD OILS.
NON-ASPHALTIC ROAD OILS.

Stanolind Paving Asphalts

Grades—Made in four grades, differing in consistency only, not in quality.

Grade "A"—For heavy traffic sheet asphalt pavements.

Grade "B"—For sheet asphalt and asphaltic concrete pavements.

Grade "C"—For asphalt macadam pavements (penetration method).

Grade "D"—For surface treatment of roads and pavements.

Description—All asphalts (also called bitumen cements) come out of the ground. Some through crevices, cracks or other natural openings in the earth's surface, some through pipes driven into the earth.

As secured from the earth, asphalts differ in degrees of consistency and in degrees of purity, and must be refined before they are adaptable to commercial use.

The value of asphalt is determined by its consistency, by its purity, by its bitumen content, and by its cementing power, ductility, stability, and low volatility.

It will therefore be readily seen how important it is that it should be refined properly in order that it may be brought to the right consistency, as free from impurities and as nearly pure bitumen as it is possible to make it. Stanolind paving asphalts are refined from asphaltic petroleum, through distillation and steam agitation, by an improved method in one of the largest refineries in the world.

Stanolind paving asphalts have all of the necessary qualities required of bitumen cement. In fact, they have a greater cementing strength than most of the asphalts on the market. They give perfect results in the wide range of climatic changes met with throughout the United States.

Stanolind Paving Filler and Standard Paving Filler

Both of these fillers are for brick and granite block pavements and comply with the specifications of the National Paving Brick Manufacturers Association.

Briquetting Asphalts

Stanolind briquetting asphalt is used in the manufacture of coal briquettes. It is a perfect cement and odorless when burning.

Roofing Asphalts

The following grades and consistencies have ample range to fill all requirements of ready made roofing and asphalt shingle manufacturers:

Parolite—soft, medium and hard.
Stanolite—semihard, soft and hard.
Stanolind Saturating Asphalt.
Petroleum Tailings.
Fluxing Asphaltums.

Fluxing Asphaltum

Grade 6 S is recommended for use in tempering both paving and roofing asphalt.

Asphaltic Road Oils

Furnished in grades Nos. 3, 4, 5 and 6. No. 3 is the lightest, containing not less than 30% asphalt. No. 6 is the heaviest, containing not less than 60% asphalt at 100 penetration. No. 3 is recommended for laying dust and as a dust preventive. Nos. 4 and 5 are recommended as dust preventives and for waterproofing earth roads, macadam roads, and gravel roads. No. 6 is recommended for second or third treatment of roads.

Forty-eight page illustrated book on road oil and its uses sent free on request.

Non-asphaltic Road Oils

For dust laying purposes on brick roads, bridle paths, park walks, tennis courts, etc.

Use of Asphalt

We suggest to engineers and architects that when planning for the use of asphalt cement they use the following specifications:

Specifications for Asphalt for Asphaltic Cement to be Used in Sheet Asphalt and Asphaltic Concrete

By the careful distillation of petroleum with steam agitation at a temperature not exceeding 700° Fahr. until the resulting residue has a consistency not harder than 30 penetration, the specific gravity of which shall at 77° Fahr. be not less than 1.0.

(a) The solid residue so obtained shall be soluble in carbon tetrachloride to the extent of 98½%.

(b) If the solubility in carbon tetrachloride of the solid residue is less than 99%, the bitumen shall yield upon ignition not more than 15% of fixed carbon; if the solubility is 99% or more, the bitumen shall yield upon ignition not more than 18% of fixed carbon.

(c) When 50 grams of the material are heated for 5 hours at a temperature of 325° Fahr. in a tin box 2½ in. in diameter by 1¾ in. deep, after the manner officially prescribed, it shall lose not over 5% by weight, nor shall the penetration after such heating be less than one-half the original penetration.

(d) When the refined asphalt is brought to a penetration of 50 by the use of the flux with which it is to be combined in making the asphaltic cement or by heating at a temperature below 500° Fahr., it shall have a ductility of not less than 100 centimeters, test to be made at the rate of 60 centimeters per minute.

(e) The asphaltic cement shall show a cementing value of .25 of a kilogrammeter at 5° C. when tested at a penetration ranging from 50 to 70; test to be made as described on page 796, Vol. 6, Journal of Industrial and Engineering Chemistry.

(f) Asphaltic cement shall have a ductility of not less than 5 centimeters when tested at 5° C., test to be made at the rate of ¼ centimeter per minute.

The penetration of the asphalt used shall range between 40 and 65 and shall be within 5 points of such penetration as is deemed best for the particular work for which the specifications are drawn.

Our recommendations for repair work are from 35 to 45 penetration; for sheet asphalt on medium traffic streets, from 50 to 60 penetration, and for asphaltic concrete on medium traffic streets, from 55 to 65 penetration, when Stanolind paving asphalt is used.

Specifications for Asphaltic Cement to be Used in Asphalt Macadam Pavements (Penetration Method)

(a) The asphaltic cement shall have a specific gravity at 77° Fahr. of not less than 1.0.

(b) The bitumen of the asphaltic cement shall be soluble in carbon tetrachloride to the extent of at least 98½%.

(c) The fixed carbon of the asphaltic cement shall be not less than 8% nor more than 16%.

(d) The melting or softening point of the asphaltic cement shall be not less than 100° Fahr. nor more than 135° Fahr.

(e) The asphaltic cement shall have a penetration of from 80 to 150, which shall be varied within these limits to adapt it to the particular asphalt used and to conditions of the streets.

(f) When 50 grams of the asphaltic cement of the consistency used in the paving mixture are heated for 5 hours at a temperature of 325° Fahr. in a tin box 2½ in. in diameter by 1¾ in. deep, there must not be volatilized more than 3% of the bitumen, nor shall the penetration after such heating be less than one-half the original penetration.

(g) A briquette of the asphaltic cement of a consistency equivalent to 80 penetration shall have a ductility of at least 100 centimeters, tests made at the rate of 60 centimeters per minute.

(h) The asphaltic cement shall show a cementing value of 0.15 kilogrammeters at 5° C. according to method of test described in Journal of Industrial and Engineering Chemistry, page 796, Vol. 6. Test for cementing value to be made at a penetration ranging from 90 to 110.

(i) Asphaltic cement shall have a ductility of not less than 5 centimeters when tested at 5° C., test to be made at the rate of ¼ centimeter per minute.

We recommend the penetration for Stanolind paving asphalt to be used on medium traffic (penetration work) at from 100 to 120.

Specifications for Asphaltic Cement for Surface Treatments on Brick, Concrete, Water Bonded Macadam or Gravel Roads, or Cinder Drives

Specific Gravity—The specific gravity of the asphaltic cement at 77° Fahr. shall not be less than unity.

Loss by Volatilization—When 50 grams of the asphaltic cement are heated in a cylindrical vessel (tin box) 2½ in. in

diameter by 1¾ in. deep at a temperature of 325° Fahr. for 5 hours, the loss in weight shall not be greater than 5%, nor shall the penetration at 77° Fahr. after heating be less than one-half the original penetration.

Penetration—The asphaltic cement shall have a penetration of from 175 to 225 when tested for 5 seconds at 77° Fahr. with a No. 2 needle weighted with 100 grams. Its penetration at 32° Fahr., when tested for one minute with a No. 2 needle under a weight of 200 grams, shall not be less than 20.

Fixed Carbon—The asphaltic cement shall not yield more than 16% of fixed carbon when a 1-gram sample in a platinum crucible 35 millimeters by 35 millimeters is heated for 7 minutes in the full flame of a No. 4 Meker burner, according to the method recommended by the American Society for Testing Materials for the determination of fixed carbon in coal.

Flash Point—It shall have a flash point of not less than 350° Fahr.

Paraffin Scale—It shall not contain more than 15% of paraffin scale by the Holde method.

Ductility—It shall have a ductility at 77° Fahr. of not less than 100 centimeters when a Dow mould is pulled at the rate of 60 centimeters per minute.

Soluble in Carbon Bisulphide—The asphaltic cement shall be soluble in chemically pure carbon bisulphide to the extent of at least 98½%.

Soluble in Carbon Tetrachloride—The asphaltic cement shall be soluble in chemically pure carbon tetrachloride to the extent of at least 90%.

Viscosity—It shall have a viscosity at 32° Fahr. of not less than 0.55 gram; the viscosity of the asphaltic cement, by the terms of this specification, shall mean the number of grams of asphaltic cement that will in 4 hours be forced through a circular orifice 1 centimeter in diameter by a pressure equal to that exerted by a column of mercury 150 centimeters high. The asphaltic cement during this test shall be contained in an iron cylinder 42 millimeters in diameter and 100 millimeters high, and the thickness of the plate through which the orifice is made shall not be more than 2 millimeters.

Residue—When 20 cubic centimeters of naphtha solution, obtained by treating 1 gram of the asphaltic cement with 100 cubic centimeters of cold naphtha, and filtering, is evaporated, the residue shall be adhesive, not merely oily.

The penetration we recommend for this class of work in most cases is from 190 to 210.

Booklet on "Specifications"

Furnished free on request.

In connection with the use of asphaltic cement in different kinds of pavements, we have published a Stanolind Paving Asphaltic Booklet that gives complete specifications for the different types of pavement in which asphalts are used and also for the different surface treatments. The specifications cover a wide range, including treatments for pavements of all the different kinds. It also includes recommendations on paving fillers, on expansion joints, etc. Useful tables and general information in regard to asphalt and in regard to paving construction in general are also included.

Shipments of Asphalt

The asphalt products are shipped in iron drums and also in bulk in tank cars. The drums for softer asphalts are especially heavy, double headed and tightly sealed.

Co-operative Service

Special and prompt attention is given to all requests and inquiries for information regarding the various uses of our asphaltic products.

THE PHILIP CAREY COMPANY

Manufacturers of Expansion Joints
LOCKLAND, CINCINNATI, OHIO

FIFTY BRANCHES AND DISTRIBUTING POINTS IN NORTH AND SOUTH AMERICA AND EUROPE
FACTORIES: LOCKLAND, OHIO, AND PLYMOUTH MEETING, PA.

Product

CAREY ELASTITE EXPANSION JOINT.
For Waterproofing and Dampproofing Materials, see page 68; for Built-up Roofing, see page 142; for Pipe Coverings, see pages 530-531.



compensate for temperature changes. Elastite is furnished in strips or slabs of any desired length, width and thickness. It is installed without loss or breakage as easily as spacing strips, becoming an integral part of the work and functions as a safety measure as long as the structure itself endures.

Experience and Facilities

The largest single organization in the world devoted exclusively to the production, refining and fabrication of the lines mentioned. Absolute control of raw materials, large manufacturing capacity and continuous operation for nearly 50 years result in low manufacturing costs and offer a guarantee of honest materials, expert craftsmanship, and up-to-the-minute construction.

Engineering Service

The advice and information this company is prepared to furnish for the employment of any of its materials to meet any particular requirement embrace the results of the combined experience and study of many experts and engineers in almost every section of the country over a long period of years. There is no charge or obligation for this consultation service.

Description and Adaptability of Elastite Expansion Joint

Carey Elastite expansion joint consists of a heavy body of special asphaltic compound "sandwiched" between two layers of high grade asphalt saturated wool felt, the whole being separably bonded together to a uniform thickness by the Carey mechanical combining process.

Elastite is installed in any construction work wherever provision should be made for expansion of rigid materials which would crack or buckle unless easement is provided to

Roof Construction

Cracks, ruptures or movement of concrete roof slabs are frequently the source of aggravating and annoying roofing troubles. Specially trained experts will cheerfully offer every co-operation in recommending suitable installations under any clearly defined situation.

Concrete Floor Construction

Install Carey Elastite expansion joint at least $\frac{1}{2}$ in. thick for the full depth of the slab and in a true perpendicular between all walls, pillars and other obstructions. Installed in this manner, Elastite serves not only as an easement for the expansion of the concrete but likewise as a vibration wave retardant to the extent of absorbing vibrations and checking their communication to the walls and adjacent floor slabs.

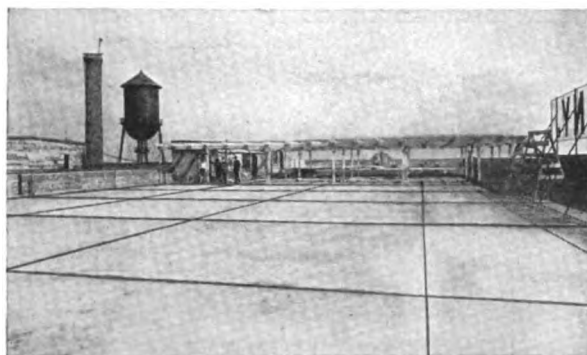
Sidewalks and Driveways

Install Carey Elastite expansion joints $\frac{1}{2}$ in. thick in all cement sidewalks and driveways at intervals of not over 30 ft., truly vertical and at right angles to the pavement. Make similar installations at the curb or radius returns where the sidewalk or driveway joins the curb.

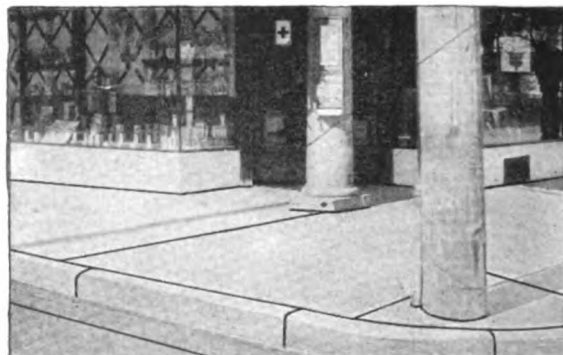
Where sidewalks or driveways adjoin buildings or extend from building to curb, place Elastite expansion joints to a depth of 12 in. to serve not only as an expansion joint for the concrete but also to reduce shock and noise waves entering the building, and likewise to serve as a dampproofing medium.



ELASTITE USED FOR EXPANSION JOINTS IN YALE BOWL



ELASTITE JOINTS IN ROOF GARDEN SLAB



AN IDEAL SIDEWALK APPLICATION OF ELASTITE

SERVICISED PRODUCTS COMPANY

(Not Incorporated)

Expansion Paving Joints, Fillers, Sponge Bitumen and Roofing

TELEPHONE
RANDOLPH 0755

First National Bank Building
CHICAGO, ILL.

Products

EXPANSION PAVING JOINTS; CONTRACTION EXPANSION JOINTS; PREPARED ROOFING and SHINGLES, Plain or Slate Surfaced; SPONGE BITUMEN; PIPE COVERINGS.

Also Saturated Felt Joint Tapes; Prepared Roofing Tapes; Cold Water and Oil Paints.

Advantages of Servicised Products

Our products are the result of careful scientific research in their respective fields. They are efficient and designed to perform the function intended in the most economical manner consistent with satisfactory results.

Expansion Paving Joints

Type A—Known as the "feather joint" because of its lightness, making it an excellent, economical material where long hauls are necessary.

Specifications—Expansion joint shall be constructed of a waterproof compacted mixture of mineral, cotton, wood or wood fiber consisting of not less than 70% air cells. Fiber exposed shall unite with cement surface of slab wall on either side. Crown shall be completely saturated with bituminous material (meeting the usual specifications) to a depth of 2 in. Base shall be saturated to a height of $\frac{3}{4}$ in. from lower edge. There shall be no elongation upon compression up to $\frac{1}{2}$ in.

Type AA—Consists of a solid bituminous crown and wings having a center cellular fiber core.

Specifications—Expansion joint shall consist of a bituminous body meeting the usual specifications and containing not more than 25% foreign matter. Crown shall be solid to a depth of 2 in.; winged sides shall be of the same bituminous matter and free of saturated felt. Bituminous sides shall be prevented from adhering in packing by a dust coating which readily unites with concrete, thus binding bituminous wings to face of slab. Joint shall have a compressible fibrous waterproof core containing not less than 70% air cells.

Type B—A solid bituminous joint containing not over 25% foreign matter and having interspersed cellular matter of a compressible nature.

Specifications—Expansion joint shall consist of bituminous material meeting the usual specifications. It shall have interspersed throughout the body cellular waterproof granules containing not less than 70% air cells and partly compressible within itself. Sides shall be free of saturated felt and dusted with a material readily uniting with concrete, thus binding joint to slab.

Type C—A thin joint of waterproof felt, particularly suitable for alley and sidewalk use.

Specifications—Expansion joint shall be coated with bituminous material meeting the usual specifications, the faces of which shall have been dusted with a material readily uniting with concrete, thus binding joint to faces of slabs adjoining.



TRADE-MARK

Type D—A self-expanding expansion joint, guaranteeing a waterproof joint regardless of temperature changes.

Specifications—Expansion joint shall consist of bituminous material meeting the usual specifications. It shall have a solid crown not less than 2 in. in depth; expanding wings and base shall consist of the same bituminous material. Core of

joint shall have a cellular compact flax or waterproof compressible air cell structure. In no case shall air cells average less than 70%. Upon compression, joint shall compress not less than $\frac{1}{4}$ in. and shall re-expand upon release of pressure. Sides shall be free of saturated felt and dusted with a material readily uniting with concrete, thus binding sides to face of slabs upon setting.

Type E—A non-oozing expansion joint, compressible within itself without elongation.

Specifications—Expansion joint shall consist of a treated stiff matted vegetable fiber, waterproofed by capillary action, thus preserving the cellular structure. Crown, base and edges shall be solidly saturated to a depth of at least 1 in. There shall be no bleeding or elongation on test of a cross section when exposed to a temperature of 300° Fahr. Joint may be compacted, in which case edges need not be treated but shall meet the bleeding test. Joint shall not be brittle at freezing temperature. Sides shall be coated with a material readily uniting with concrete.

Contraction Expansion Joints (Patent Applied For)

Placed in the same manner as the regular contraction joint with the exception that they automatically waterproof crevices immediately on forming.

Full particulars on request.

Roofings

Our roll roofings are prepared from long fiber felt saturated with high grade asphalts in both plain and slate surfaced finishes.

Our asbestos shingle and slate roofings are laid according to the economical Servicised method (patents pending).

Sponge Bitumen (U. S. Patent 1401974, Jan. 3, 1922)

An expanding cellular asphalt especially treated for calking, insulating and packing purposes; also a suitable material to place over a concrete base, serving as both tar coating and sand cushion.

Full particulars on request.

Pipe Coverings

For hot water pipes, our air cell covering is made of best asbestos paper and is constructed so as to create airtight compartments. For steam pipes, specify our multicell or magnesia covering.

A full line of pipe coverings is carried for exposed cold water pipe lines. Made from the highest quality of wool felt and lined with a heavy waterproof paper. Hair felt coverings a specialty.



TYPE D
JOINT



TYPE E
JOINT



TYPE AA
JOINT



TYPE C
JOINT

THE HUGHES-KEENAN CO.

Safety-Lock Pressed Steel Stairs and Architectural Iron Work
MANSFIELD, OHIO

Products

Manufacturers of FIREPROOF STEEL STAIRS.

Also manufacturers of Fire Escapes and Architectural Iron Work.

For Hygea Steel Toilet Partitions, see page 276.



TRADE-MARK

Hughes-Keenan Steel Stairs

The Hughes-Keenan steel stairs (patent pending) consist of Safety-Lock treads and risers with safety tread nosing construction, interlocked pressed steel stringers and baluster mounting which permits adjustment for maintaining the balusters in vertical position regardless of the pitch of the stairs. See details.

In presenting a safety-locking pressed steel tread and risers together with their interlocking pressed steel stringers for stair construction, THE HUGHES-KEENAN Co. has really brought out a product of considerable merit and one that eliminates many of the objectionable features found in pressed steel stair construction.

Special attention is directed to the safety nosing with this new type of construction. Architects and builders have long felt the need of a product embodying a safety stair construction at a lower cost than has heretofore been possible. In this construction we accomplish this very desirable feature.

Safety-Lock Treads and Risers—Consist of steel riser and tread members interlocked at nosing, secured firmly to the stringers and reinforced by tie

rods, one to each step, which run under the angle of nosings from stringer to stringer. The treads are made to receive cement, composition of asphalt tread surfaces.

Nosings—Nosings are made in plain design, as shown in details on the following page, and also with safety or non-slipping tread, which will tend to prevent accident to the user of the stairs, the nose piece also acting as a lock for positively holding together the tread member and riser and avoiding any displacement thereof.

Two types of the safety or non-slipping tread are shown on the following page and in each type the nosing is removable to allow for replacement.

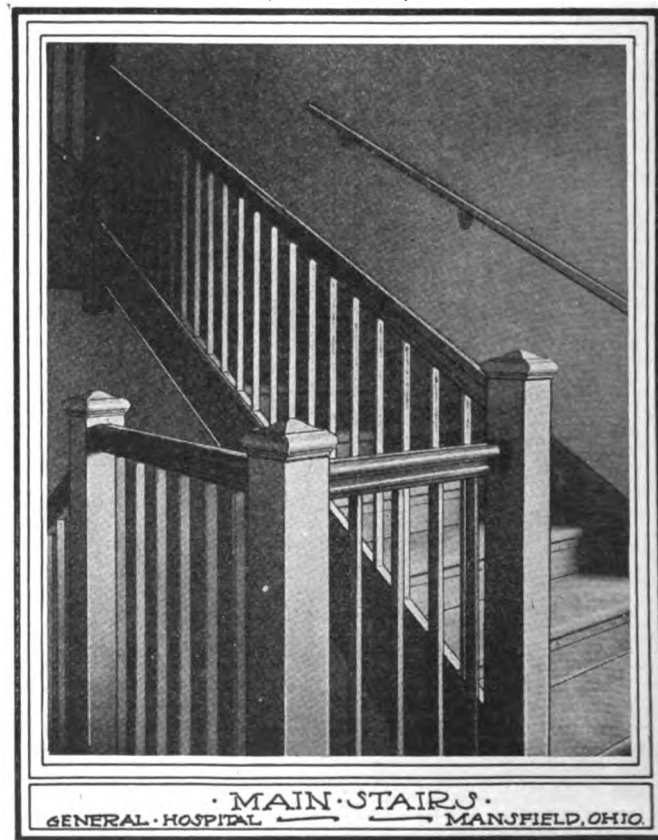
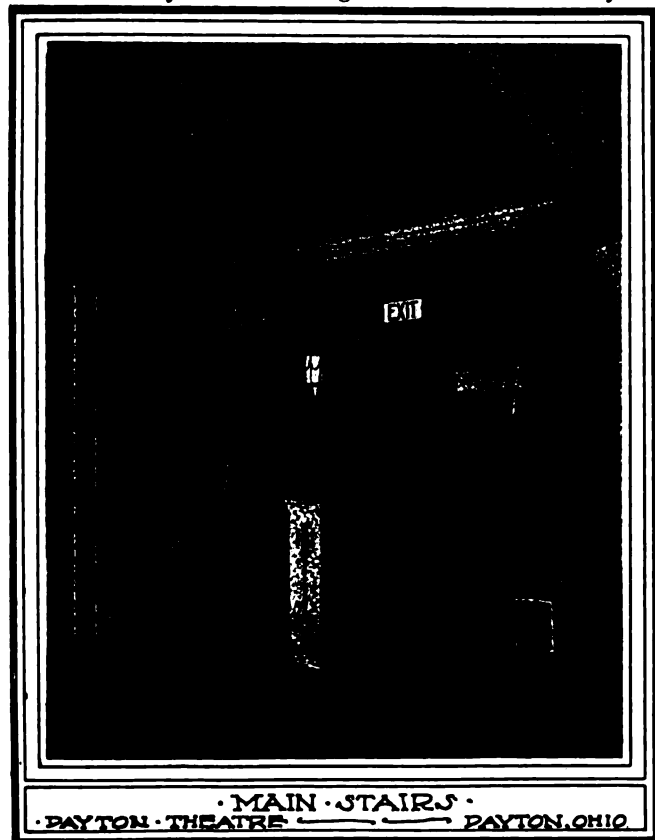
Stringers—Stringers are formed of two sections or sheets, secured together with interlocking flanges which provide seats for the stair risers and treads and to which are secured the balusters which are adjustable to any pitch of the stringer.

The assembled stair forms a mass which is practically free from vibration under loading stress. This insures the highest limit of efficiency against damage or failure by fire.

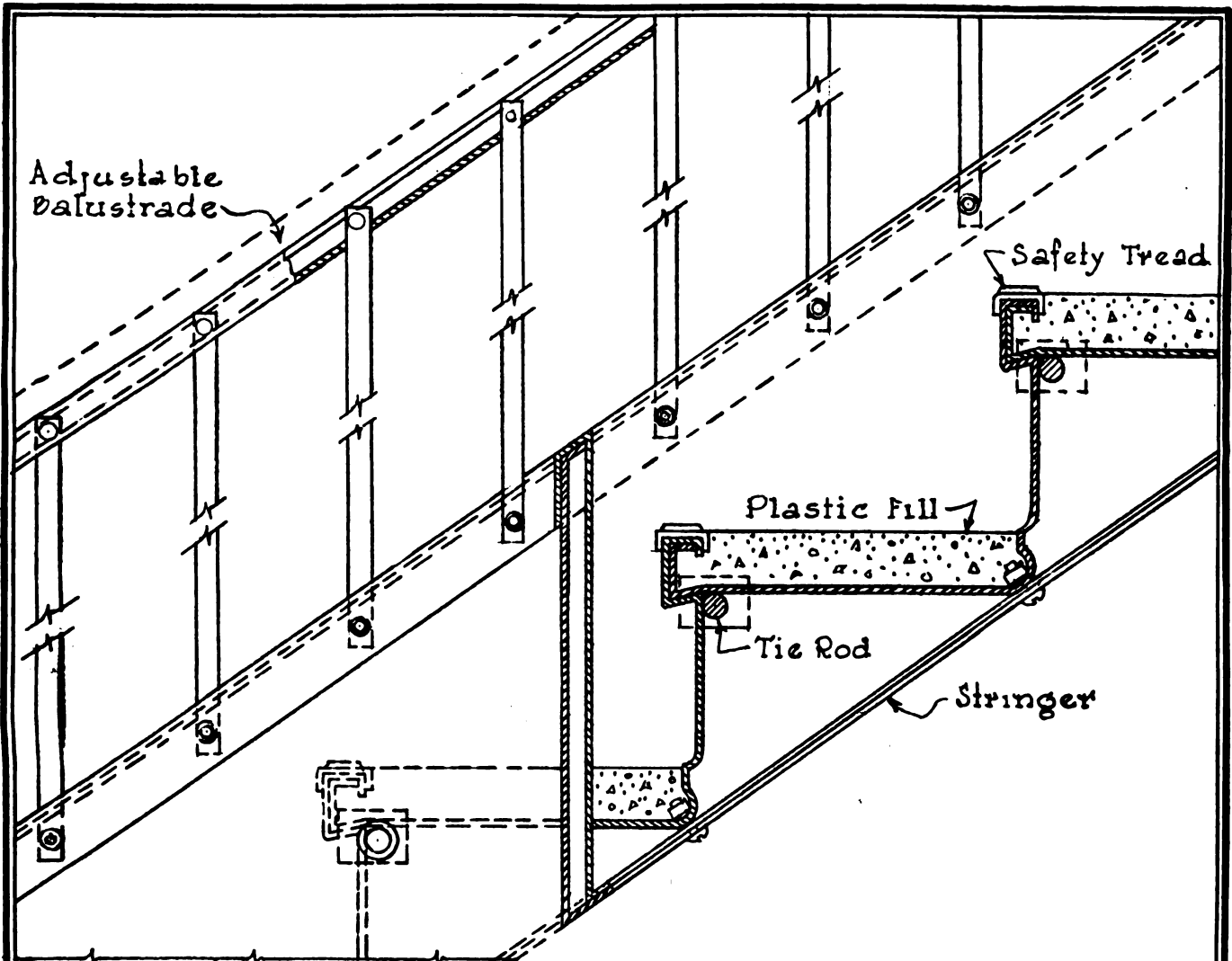
Installation—Shipped complete, ready to set up, This insures quick and economical installation; also immediate use, before the installation of the finished treads.

Information and Estimates

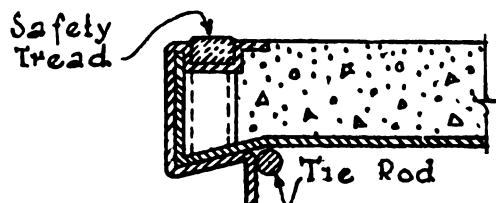
For information and estimates, write THE HUGHES-KEENAN Co., Mansfield, Ohio.



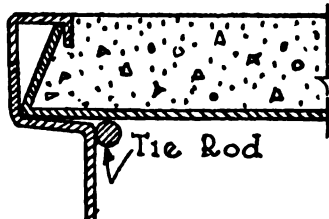
EXAMPLES OF ARCHITECTURAL IRON WORK EXECUTED BY THE HUGHES-KEENAN CO.



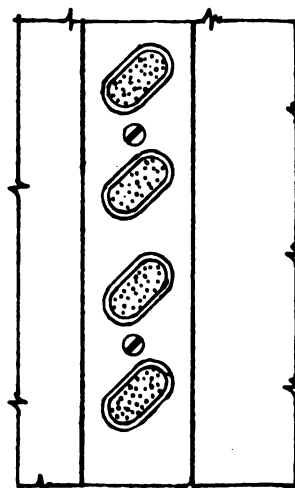
DETAIL SHOWING TREADS RISERS AND ADJUSTABLE BALUSTRADE



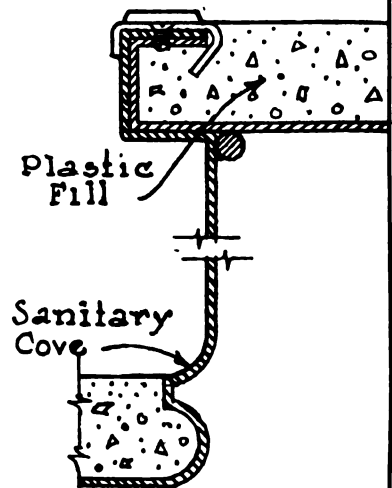
DETAIL SHOWING NOSING WITH SAFETY TREAD



DETAIL SHOWING PLAIN NOSING



PLAN OF SAFETY TREAD NOSING



DETAIL SHOWING TREAD AND RISER

DRAWN BY
SWEET'S CATALOGUE
SERVICE INC.

DETAILS OF
THE HUGHES-KEENAN STEEL STAIRS

NOT DRAWN TO
SCALE
1

AMERICAN ABRASIVE METALS CO.

Manufacturers of Antislip Treads

TELEPHONE
CORTLANDT 7444, 7445

Hudson Terminal Building, 50 Church Street
NEW YORK, N. Y.

Products

FERALUN, VULCALUN, BRONZALUN and ALUMALUN ANTISLIP TREAD SURFACES.

Also manufacturers of Feralun Coalhole Covers, Vault Linings and Door Plates, Rabble Blades, Pug Mill Paddles, and Brake Shoes.

Feralun

A non-porous metal with abrasive grit embedded in the wearing surface to provide an approved durable and effective antislip tread.

This grit, embedded at the time of casting, projects slightly and bites, so that slipping is prevented, and in hardness is excelled only by the diamond. Being firmly held by the metal partly surrounding each grain, the abrasive grit gives to Feralun its extreme durability.

Feralun treads are more durable than treads having lead, cement or asphalt as the body. They do not deteriorate through corrosion, as they do not have a steel base.



FERALUN ANTISLIP TREAD
Note the antislip nosing and absence of grooves parallel to it

Approved without qualification as fire safe and antislip treads by the Underwriters' Laboratories, Inc.

Valcalun

A vulcanized mixture of rubber and abrasive grit. Made in sheets up to 12x30 in. and in tile of suitable sizes.

Its outstanding advantages are:

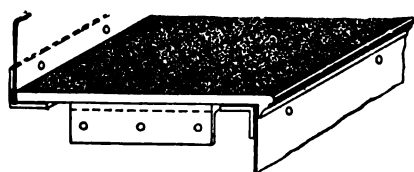
(1) High dielectric strength showing no flash-over up to 15,000 volts. It is therefore desirable for walkway surfaces around switchboards, etc.

(2) Light weight—from $3\frac{1}{2}$ to 7 lbs. per sq. ft.—making it desirable for elevator car floors, automobile running boards, car steps, etc.

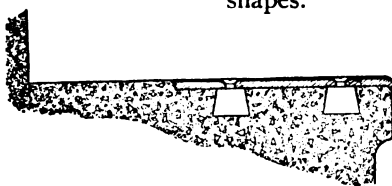
(3) Does not corrode and therefore can be used on marble and elsewhere. Is not absorbent and does not disintegrate or discolor.

Bronzalun

A combination of bronze and abrasive grit manufactured in the same manner as Feralun. For use as a tread surface where fine appearance is desirable in addition to the other features of Feralun.



STYLE "O" FERALUN ONE-PIECE
ANTISLIP TREAD, REQUIRING
NO SUBTREAD



APPROVED CONCRETE STEP CON-
STRUCTION, WITH STYLE "A"
FERALUN INSERT 6 IN. WIDE



APPROVED METHOD OF REPAIRING
WORN STEPS

Alumalun

An aluminum alloy embodying abrasive grit. Is salt water resistant and tensile strength is much greater than ordinary aluminum. Used where resistance to corrosion and good appearance with light weight are essential.

A Few Applications

Antislip Walkway Surfaces

Feralun, Vulcalun, Bronzalun and Alumalun are especially suitable for flooring around moving machinery, steps and running boards in boiler and engine rooms, trench covers, drainage gratings, manhole and coal-hole covers, door saddles, etc. Their use prevents the serious accidents caused by slippery steel and iron surfaces.

Antislip Stair Treads—

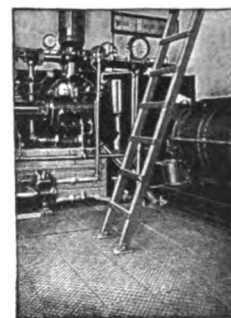
Feralun, Vulcalun, Bronzalun and Alumalun antislip stair treads are fireproof and slip-proof, lasting much longer than iron, steel, slate or marble. They have no dangerous, slippery nosing edge or heel-catching grooves. A plain or hatched abrasive surface, with the antislip element carried down over the nosing, makes these stair treads unequaled as a preventive of stair accidents.

Feralun Rabble Blades and Pug Mill Paddles—

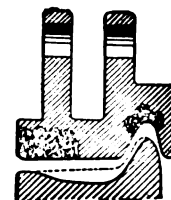
Made of special iron composition with lumps of abrasive grit embedded in the metal where needed to resist wear. Last 5 to 10 times as long as cast iron and save time and cost of frequent renewals. Obtainable in any design desired to fit the various types of holders used.

Feralun Brake Shoes—Feralun brake shoes not only keep new wheels from double flanging but are the only shoes effectively removing the false flange on worn wheels. This saves the expense of taking off and replacing wheels because of false flanges, turning down tires, temporary loss of engine and wear on frogs and switches.

Made for all standard makes of locomotive and all wheel diameters and widths. Also special sizes and shapes.



FERALUN FLOORS IN
ENGINE ROOM OF CON-
SOLIDATED GAS CO. OF
NEW YORK CITY



SECTION OF FERALUN
BRAKE SHOE
Showing location of
cutting abrasive and
part of wheel flange
to be cut down

AMERICAN MASON SAFETY TREAD CO.

LOWELL, MASS.

BRANCH OFFICES

NEW YORK, N. Y., 41 East 42nd Street

PHILADELPHIA, PA., 900 Widener Building

GENERAL WESTERN DISTRIBUTERS: JOSEPH T. RYERSON & SON, CHICAGO, ILL.; ST. LOUIS, MO.; CLEVELAND, OHIO;
DETROIT, MICH.; MINNEAPOLIS, MINN.; MILWAUKEE, WIS.

Products

MASON SAFETY TREAD (lead or carborundum filled).

Also Stanwood Step and Tread, Stair Nosings, Mason Non-slip Ladder Shoes, Karbolith Flooring.



UNDERWRITERS' LABEL

Uses of Mason Safety Treads

Mason safety treads are adaptable to all situations, inside or outside of a building, where the surface with which the foot comes in contact is liable to become slippery or where the steps have become worn, cupped or hollowed.

Mason safety treads are suitable for use on granite, marble, slate, cement, iron or wood stairs. They can be installed during construction or on old stairs.

They are especially desirable for the equipment of stairs in school buildings, department stores and wherever the traffic is heavy; for thresholds of doors and elevators, fire doors, inclined passageways, ramps and floors around machinery.

Standard Sizes of Mason Safety Treads

Steel Base—Width, $2\frac{1}{2}$, $3\frac{3}{4}$, 4, $4\frac{3}{4}$ and 6 in. flat; 3 in. with nosing or overhang and square back, and $3\frac{1}{2}$ in. with nosing and beveled back. These sizes

flat surface tread, as they catch and hold any foreign substance which might be dropped upon them, such as pencils, burned matches, cigar ends or wads of paper, giving the foot a sure contact.

With the Mason safety tread there can be no filling of open grooves with mushrooming or creeping lead, no jagged edges for the retention of filth or germs, and

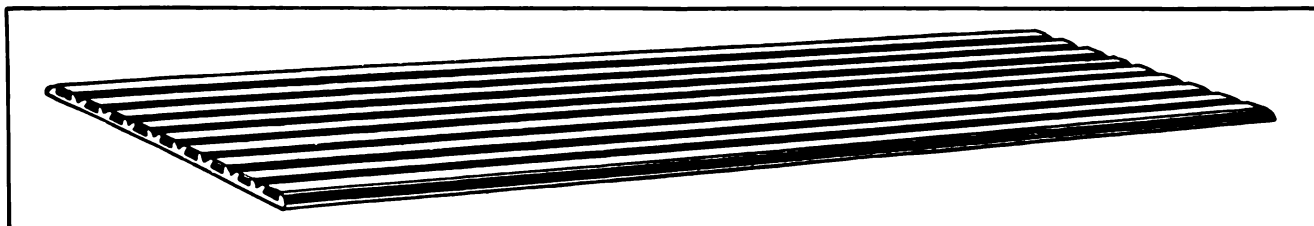
there is no abrasive top dressing to wear off and leave a polished, dangerous, slip-inviting surface.

Mason safety treads are especially desirable for use on stairs of concrete, as they prevent the raw edges from chipping off. For this use, a special anchor is furnished which holds the treads firmly in place. These anchors are easily worked into the soft concrete.

Insurance

Establishments employing labor find it desirable to equip their stairs with Mason safety tread, as accident insurance companies expect and demand all reasonable endeavor on the policy-holders' part to make the plant safe. They indorse and recommend the use of this material.

Mason safety treads have been used constantly for over 25 years, and over 7,000,000 sq. ft. have been sold.



MASON SAFETY TREAD

in combination (with the exception of the 3-in. width) will produce any desired width. Cut to order with necessary countersunk holes and with anchors when used in connection with cement.

Hard Brass Base—Width, 2, $2\frac{1}{4}$, $2\frac{1}{2}$, $2\frac{3}{4}$, 3, $3\frac{1}{2}$, 4 and 6 in. flat; with nosing similar to that of steel base in widths of $2\frac{1}{8}$ and $3\frac{1}{2}$ in. and with deep nosing in width of $2\frac{3}{4}$ in.

Description of Mason Safety Treads

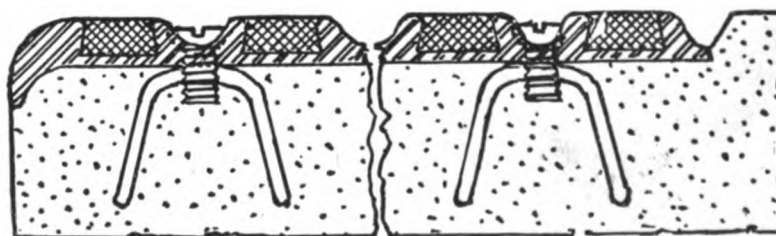
Mason safety treads are made of rolled steel or extruded hard brass (delta metal) of substantial thickness ($\frac{1}{4}$ in.) with alternate dovetailed and U-shaped grooves. The dovetailed grooves are filled either with lead or a mixture containing a large proportion of carborundum and other abrasive substances, firmly held in place by the continuous supporting ribs of hard metal, which give long wear, preserving the non-slipping quality of the tread for a long series of years.

The open U-shaped grooves not only add to the slip-resisting quality of the tread, but facilitate cleanliness, as they can be easily swept or washed out. They also serve as a protection against the danger inherent in a

Repairing Worn Stairs with Mason Safety Tread

Badly worn stairs are brought to a finished condition by the use of Karbolith filling which forms a bed for Mason safety tread.

The width of safety tread required can readily be determined by the amount of wear on the wood or marble stairs but should never be less than $7\frac{1}{2}$ in. When the stairs are so deeply worn that the nosing shown on the $3\frac{1}{2}$ -in. section below will not cover the edge of the filling used to restore the level, a brass tread with deep nosing or a false nosing of steel is furnished, conforming to the shape of the edge of the stair tread, to which the safety tread is welded.



MASON SAFETY TREAD AS APPLIED TO NEW CONCRETE

IRVING IRON WORKS COMPANY

Manufacturers of Grating Flooring and Safety Steps

TELEPHONE
HUNTERS POINT 3342

Dutchkill Creek and Third Street
LONG ISLAND CITY, N. Y.

Products

Sole manufacturers of "IRVING SUBWAY" GRATING or METALLIC FLOORING; "IRVING SAFSTEP" STAIR and LADDER STEPS.

Also manufacturers of "Sunway," "Reticuline," "Eggcrate," "Honeycomb," and other forms of Grating, Grating-flooring, and Grating-flooring Accessories; Irving Walkways; Metal Accessories for power and industrial plants.

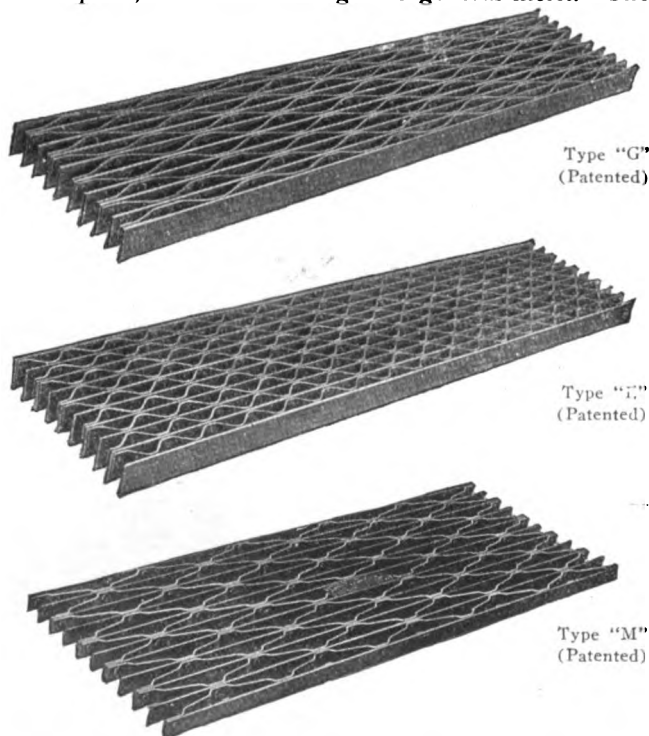
Trade-marks

The trade-marks "Subway," "Sunway," "Reticuline," and "Safstep" are registered in the United States Patent Office, are the exclusive property of this company, and can not legally be used in connection with any other grating or grating-flooring product made by any other company.

"Irving Subway" Grating

Construction—"Irving Subway" consists of a series of light steel bars placed on edge, between each pair of which a reticuline bar is firmly riveted in position. The finished section is a light, inflexible panel embodying the well-known truss principle by which a load applied at any point is distributed over a wide area. Maximum strength is thus secured with the minimum weight. Each section of "Irving Subway" is, in all essentials, a solid unit, in which there is, and can be, no looseness, no play, no rattling.

Types—There are three standard types of "Irving Subway" as illustrated below, differing in appearance and in price, but not in strength or general merit. The



THREE STANDARD TYPES OF "IRVING SUBWAY" GRATING

SWEET'S CATALOGUE

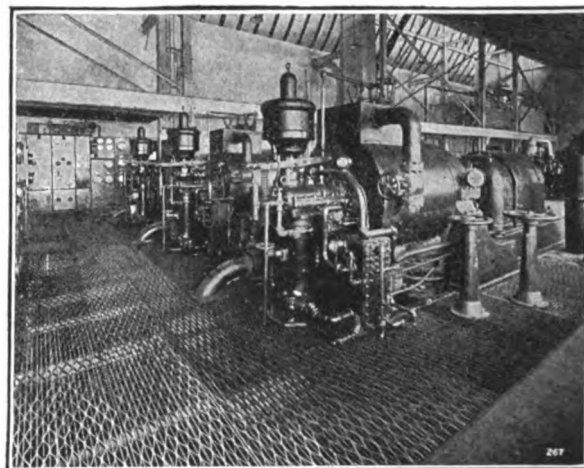
IRVING SUBWAY
TRADE MARK
PATENTED
THE FIREPROOF VENTILATING FLOORING

IRVING SAFSTEP
TRADE MARK
PATENTED
ABSOLUTELY NON-SLIPPING ALWAYS

rated load capacity is the same for all. Choice between them is to be determined by the factor of size and shape of mesh.

Exclusive Advantages—Maximum strength per unit of weight; maximum weight per unit of load and span; uniform distribution of load by truss construction; maximum lighting and ventilation opening (80% of panel area); absolutely non-slipping surface; can not become loose and rattly; oil or grease, age or wear does not impair its non-slipping qualities; small size of individual openings (mesh) prevents passage of tools, etc.; wheels or rib-hooped barrels can be rolled over it in any direction without going through; its light weight permits minimum weight and cost of the supporting structure; safe to work under because nothing large or heavy can fall through it; openings for pipes, columns, etc., can be cut out without seriously impairing the strength; easily fitted into corners or formed in irregular shapes; easily mounted or attached to any type of construction without drilling, tapping, bolts or screws.

Applications—Floors, walkways, and galleries in power plants; boiler room floors in oil-fired plants; pump platforms; coverings for turbine pits, pipe trenches, and drainage sumps; floors for mine cages, freight elevators, elevator pent houses, shaft houses; floors and platforms around tanks or vats; charging floors; floors of gas plants and retort houses; a substitute for water cooled plates, affording maximum area; armoring of concrete surfaces.



ENGINE ROOM FLOOR OF "IRVING SUBWAY"

"Safstep" Stair and Ladder Steps

Made entirely of steel, in reticuline construction, these safety steps are light and strong, fireproof, and permanently non-slipping under all conditions—no safety treads to wear out or work loose. Made in twenty-four standard sizes and types. Each unit is self-contained and complete, with carrier plate attached ready for mounting.

Catalogue

Catalogue No. 3A17, sent on request, gives complete description, load rating, sizes, spans, weights, etc.

KERLOW STEEL FLOORING COMPANY

Manufacturers of Steel Grating and Safety Steps

TELEPHONE
CORTLANDT 4529

50 Church Street
NEW YORK, N. Y.

Products

GRATING, SAFETY STEPS, CONCRETE INSERTS, REGISTERS, RADIATOR GUARDS.

Kerlow Steel Grating

Strong, light, economical, reversible, non-slip, fireproof and rustproofed. A safe walk and work surface. Particularly suitable for use as a floor, gallery, runway, walkway, platform or area. Also suit-

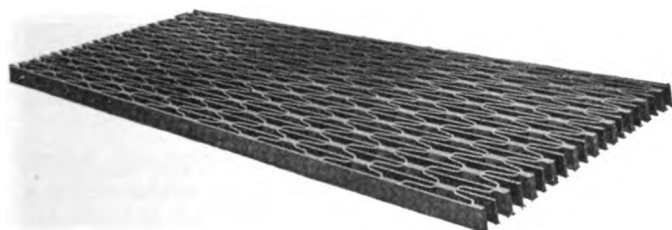
TRADE

KERLOW

MARK
GRATING PRODUCTS

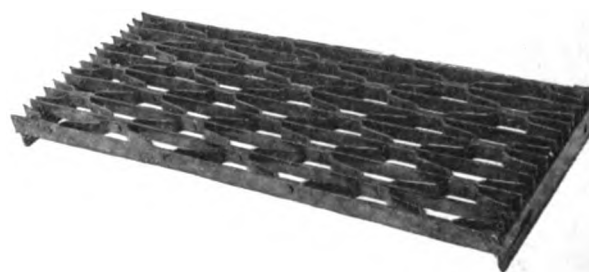
Kerlow Safety Step

A self-contained safety step, complete with universal slotted carriers, which preclude any re-drilling of bolt holes in the field. The carriers support every bar and are as strong as the grating. Kerlow safety steps are simple to install, strong, non-slip and long lived. Specially suitable for



KERLOW STEEL GRATING

able for ventilating stuffy places, armoring concrete floors, covering vats and tanks, guarding windows, racks and floors of drying ovens, cooling beds and plates, and elevator shafts.



KERLOW SAFETY STEP

exterior and interior service stairs and ladders for industrial, engineering, marine and architectural work.

Standard sizes are made $\frac{3}{4}$ and 1 in. deep; $5\frac{1}{4}$, $7\frac{3}{4}$ and $10\frac{1}{4}$ in. wide; and from 18 to 35 in. long. Special sizes are made to suit any requirements.

SAFE LOADS FOR KERLOW STEEL GRATING AND STEPS

Maximum allowable fiber stress 16,000 lbs. per sq. in. for straight bars. Allowable percentage added for crimped bars. L = load in pounds per square feet. D = deflection in inches using L. C = deflection constant D + L.

Grating number and size of bars, in.	Spans in feet and inches													Weight per sq. ft. lbs.
		2-6	3-0	3-6	4-0	4-6	5-0	5-6	6-0	6-6	7-0	8-0	9-0	
K1 Straight bars... $\frac{3}{4} \times \frac{3}{4}$	L	315	219	162	123	98	80							7
	D C	.20 .0006	.29 .0013	.40 .0024	.52 .0043	.68 .0069	.83 .0104							
K2 Straight bars... 1 $\times \frac{3}{4}$	L	560	389	286	218	173	141	116						9
	D C	.15 .0002	.20 .0004	.29 .0010	.38 .0017	.48 .0028	.61 .0042	.69 .0060						
K3 Straight bars... 1 $\times \frac{3}{4}$	L	719	499	368	281	222	180	149	125					11
	D C	.15 .0002	.20 .0004	.29 .0007	.38 .0013	.48 .0022	.61 .0032	.69 .0045	.91 .0073					
K4 Straight bars... $1\frac{1}{4} \times \frac{3}{4}$	L	875	608	450	342	270	219	180	152	129	111			10 $\frac{3}{4}$
	D C	.12 .0001	.16 .0002	.24 .0005	.30 .0008	.39 .0014	.47 .0021	.58 .0032	.70 .0046	.83 .0065	.98 .0088			
K5 Straight bars... $1\frac{1}{4} \times \frac{3}{4}$	L	1127	783	577	440	346	281	232	196	166	144	110	85	13 $\frac{3}{4}$
	D C	.12 .0001	.16 .0002	.24 .0004	.30 .0006	.39 .0011	.47 .0016	.58 .0025	.70 .0035	.83 .0050	.98 .0068	1.25 .0091	1.58 .0156	
K6 Straight bars... $1\frac{1}{2} \times \frac{3}{4}$	L	1260	873	645	492	387	315	259	219	186	161	147	117	13
	D C	.09 .0001	.14 .0001	.19 .0002	.24 .0004	.29 .0007	.38 .0012	.49 .0019	.60 .0027	.69 .0037	.77 .0048	.98 .0079	1.27 .0130	
K7 Straight bars... $1\frac{1}{2} \times \frac{3}{4}$	L	1930	1341	989	755	593	483	399	335	285	246	158	126	16
	D C	.09 .0001	.14 .0001	.19 .0002	.24 .0003	.29 .0004	.38 .0007	.49 .0012	.60 .0018	.68 .0024	.77 .0031	.98 .0062	1.27 .0101	

Kerlow Universal Register

For furnaces and air intakes. Has 78% air opening, which is greater than most registers. This permits the use of smaller floor openings.

Kerlow Universal Radiator Guard

For all makes of motor trucks. A shock absorbing, all over radiator protection which lowers insurance liability.

Kerlow Concrete Inserts

For use in concrete stairs. Made in the same sizes as the safety steps and provided with anchors. Kerlow concrete inserts prolong the life of concrete stairs indefinitely.

Catalogues

Catalogues giving complete information on any of our products will be sent on request.

MITCHELL-TAPPEN COMPANY

Interlocked Steel Grating and Standardized Metal Caging ("SMC")

15 John Street
NEW YORK, N. Y.

REPRESENTATIVES

BOSTON, MASS., ROBT B. CAMPBELL Co. ("SMC")
CARBONDALE, PA., HENDRICK MFG. Co. (GRATING)
PITTSBURGH, PA., HENDRICK MFG. Co. (GRATING)
PITTSBURGH, PA., FIREPROOF MATERIALS Co. ("SMC")

CLEVELAND, OHIO, HARRIS-MURRAY Co. ("SMC")
AKRON, OHIO, THE SHAFFER & SON Co. ("SMC" and GRATING)
DETROIT, MICH., A. H. SLOAN COMPANY, INC. (GRATING)
LOS ANGELES, CAL., N. O. FLEMING ("SMC")

Products

"MITCO" INTERLOCKED STEEL GRATING.
STANDARDIZED METAL CAGING ("SMC").

"Mitco" Interlocked Steel Grating, Pat. Oct. 26, 1915

"Mitco" Grating was developed to meet the demand for a more substantial grating than the ordinary, insecurely bolted or riveted, rattling thimble-and-rod type.

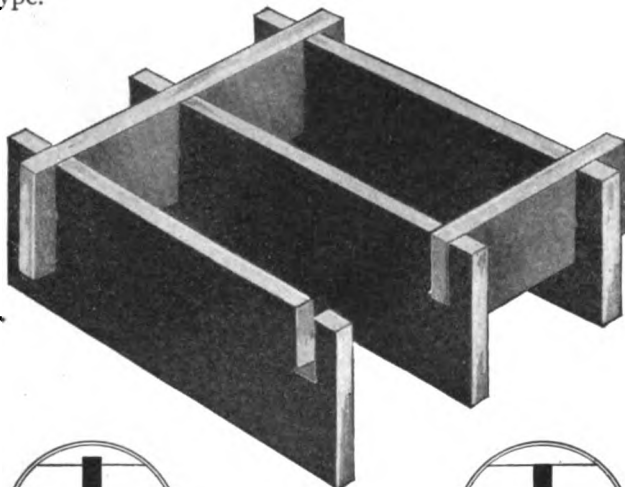


FIG. 1
DOVETAIL OF "MITCO"
GRATING



FIG. 2



FIG. 3

Bearing bars are punched with dovetail slots and lateral bars notched, and set into place so that they stand about $\frac{1}{8}$ in. above bearing bars as shown in Fig. 2. Grating is then put under a heavy press and lateral bars forced down flush as in Fig. 3. This pressure automatically spreads metal in the dovetail slots, completely filling them and making a perfect and permanent joint. Grating panels supplied with flush sides when desired.

The exceptional strength and rigidity are due to the patented interlocked construction shown above. Punching of bars does not affect carrying capacity, for dovetail slots are completely filled by lateral bars being spread out under pressure, and as these slots are above the neutral axis they are always in compression. Original strength of bearing bars is therefore developed, regardless of slots. Lateral bars, besides serving as struts, give transverse strength and firmly lock the whole construction into an integral unit, thus *distributing any concentrated load over the entire section of grating.*

Material used is best quality open hearth steel. Safe load tables sent on request.

Salient Features—No acute angles to catch and hold dirt and interfere with proper painting.

Built for permanence; no bent bars; no bolts, screws or rivets to become loose or rust; no inaccessible surfaces; no small tie-rods; no long unsupported rods.

Stronger than the unassembled bars and can be made for any shape, form or purpose.

Easy to walk on. Trucks, wheelbarrows, etc., can be rolled upon it in any direction without wheels entering spaces or distorting bars.

"Mitco" Window Guards—The square or rectangular openings can be laid out to afford maximum security, ventilation and light. They guard until the entire panel is removed. Their efficiency is not destroyed when one side is cut.

Wide Field of Application—Although originally designed for sidewalk openings over subways, "Mitco" Grating is being extensively used for general ventilating and other purposes, a few of which follow:

Powerhouse platforms and floors	Stair treads
Marine boiler and engine rooms	Pipe trench and sump covers
Elevator floors and pent houses	Pump and turbine platforms
Screens for pump intake wells	Retort houses
Trash racks	Vault guards

"Mitco" Driveway Type for Coal "Grizzlies"—Made up to $\frac{3}{8}$ in. thick and $3\frac{3}{4}$ in. deep. Armorgrids for concrete surfaces.

"Mitco" Grating is approved by New York Transit Commission for use over subways, and specified by leading engineers generally.

Standardized Metal Caging ("SMC"), Pat. Dec. 15, 1914

For fireproofing structural steel. A steel wire basket or cage (Fig. 4) which firmly grips bottom flange of steel member, locking concrete protection to steel, and providing a continuous strengthening skeleton at a *pre-determined or fixed offset from the flange.*

"SMC" can not "bunch"; it pulls out like a camera bellows, maintaining equal spacing of about 6 in. under middle of beam. It clasps flange tightly at edge, leaving a clear space for flow of concrete along face of flange. When used on girders, columns or deep beams, additional wires of special shape may be used to reinforce the side protection.

Exclusive features shown in Fig. 4. "SMC" is ready to use, and can be readily applied by inexperienced labor. Full printed directions furnished.

Caging packed close together, in collapsed sections about 4 ft. long. Easy to handle. All sizes in stock.

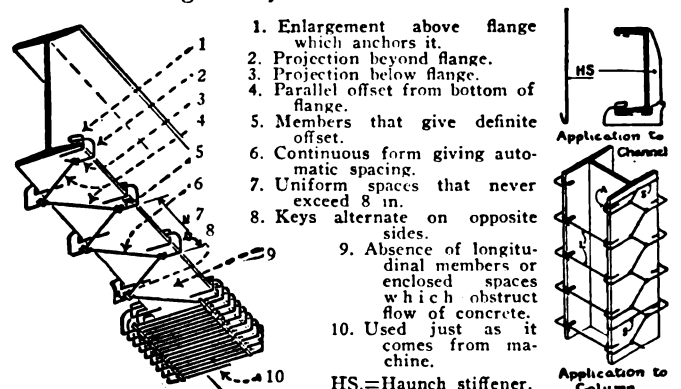


FIG. 4. APPLICATION OF STANDARDIZED METAL CAGING

End wire of section is caught over end of beam, and workman easily holds and pulls out section, which automatically locks it to the structural member. Caution: Stretch out *after* applying.

WEST COAST LUMBERMEN'S ASSOCIATION

Western Oregon and Washington Forest Products

Henry Building
SEATTLE, WASH.

NEW YORK OFFICE: Grand Central Terminal

PORTLAND, ORE., OFFICE: Yeon Building

Products

WEST COAST WOODS:

Douglas Fir Western Hemlock
Sitka Spruce Western Red Cedar

Uses

West Coast woods are particularly adapted to the following uses:

Flooring	Structural timbers
Finish	Ship timbers
Siding	Airplane stock
Shingles	Paving blocks

Timber Resources

WAR INDUSTRIES BOARD BULLETIN 43—"The Northwest is now the last great reservoir of undeveloped timber wealth in this country."

REPORT OF THE COMMITTEE FOR THE APPLICATION OF FORESTRY OF THE SOCIETY OF AMERICAN FORESTERS—"The Pacific Coast region has today the world's greatest stand of high grade timber. Within 10 years it will be supplying the bulk of the Nation's lumber."

Sitka Spruce

For airplane stock, finish, siding, and factory, shop and box grades.

The giant of the genus.

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS REPORT 67—"Spruce is the wood par excellence for the construction of aircraft."

Western Red Cedar

For finish, siding, shingles.

Western red cedar furnishes three-fourths of the shingles used in the United States.

The life of a Rite-Grade shingle is limited only by the kind of nails with which it is put on.

Douglas Fir

For flooring, finish, siding, framing, structural timbers, ship timbers, pipe and tank stock, wood block paving.

FOREST SERVICE BULLETIN 88—"Douglas fir may, perhaps, be considered as the most important of American woods. Its rapid growth in the Pacific Coast forests, and the great variety of uses to which its wood can be put, place it first. As a structural timber it is not surpassed."

Western Hemlock

For flooring, finish, siding, boards, boxes.

Western hemlock is a distinctive wood and should not be confused with other species of the same family.

FOREST SERVICE BULLETIN 115—"The demand for western hemlock will no doubt increase when its properties are better known," and, referring to a possible prejudice against it because of its species name "A thorough investigation of its properties proves this prejudice to be unfounded."

Working Stresses

In the table below are given the working stresses recommended by the Forest Products Laboratory, U. S. Forest Service, for West Coast Woods in Building use:

WORKING STRESSES, LBS. PER SQ. IN.

	Douglas Fir	Western Hemlock	Sitka Spruce	Western Red Cedar
Bending:				
Extreme fiber	1500	1300	1100	900
Horizontal shear (maximum)	95	75	85	80
Compression:				
Parallel to grain (short columns)	1100	900	800	700
Perpendicular to grain	325	300	250	200



Copyright, Darius Kinsey

A WEST COAST FOREST

THE PACIFIC LUMBER COMPANY

OF ILLINOIS

Midwestern and Eastern Distributors of California Redwood

2071 McCormick Building
CHICAGO, ILL.

NEW YORK, N. Y., 40 Rector Street

THE PACIFIC LUMBER COMPANY

Manufacturers and Pacific Coast Distributors

MILLS: SCOTIA, HUMBOLDT COUNTY, CAL.

OFFICES: 311 California Street, SAN FRANCISCO, CAL., and Central Building, Sixth and Main Streets LOS ANGELES, CAL.

EXPORT COMPANY: A. F. THANE & Co., INC.

SAN FRANCISCO, CAL., 311 California Street NEW YORK, N. Y., 40 Rector Street

Product

REDWOOD LUMBER, a non-resinous wood permeated with an odorless *natural* preservative.

For California Redwood Block Floors, see pages 152-157.

Uses

Redwood, because of its unusual and distinctive characteristics as shown below, is specially adapted to many industrial and engineering uses, some of which are given in the following general headings. These subjects are treated more fully in the pages indicated:

	PAGE
Tanks and Vats.....	180
Railroad Ties	184
Railroad Construction	184
Rolling Stock Equipment.....	184
Pipe and Flumes.....	185
Fire Door Cores.....	186
Fire Walls	186
Insulation for All Refrigeration Purposes.....	187
Lattice Roof Trusses.....	187

Distinctive Characteristics of Redwood

Redwood is a soft wood of a character highly valuable for specialty manufacturing and utilitarian purposes because it is unusually resistant to decay, rot and fire, and because of its insulating qualities. Until recent years little was known of the extraordinary values of Redwood as a specialty wood, but as Redwood is becoming better understood by industry its users are increasing continually. Moreover, production and transportation facilities are now available to supply the large demands of the future.

Color—The heart wood ranges from light cherry color to mahogany, generally an old rose color. The sap wood (of which there is very little) is a cream color.

Resistance to Decay—A *natural* preservative which permeates Redwood accounts alike for the great age of the timber (Redwood trees are the oldest living things) and for the lumber's remarkable resistance to decay. A Redwood log buried in the ground for 600 years was found to be still sound and was cut into first class lumber.

It is unnecessary to treat Redwood with artificial preservatives.

Resistance to Fire—Being free of pitch or other resinous substances, Redwood is slow to ignite, and its resistance to fire, as demonstrated in the San Francisco conflagration of 1906 and in many other fires, adapts it to many commercial purposes.

Non-conductivity—The large number of minute air cells, regularly spaced and of uniform shape, make Redwood highly non-conductive to heat or cold, and when properly dried keep it from expanding or contracting in use.

The cells in properly dried Redwood are dead air spaces, unclogged by resinous deposits found in most woods.

Texture—Soft, yet firm, of even, close grain, with a high percentage of clear wood.

Weight—Light, compared with other "soft woods."

Strength—In strength and stiffness Redwood compares favorably with other woods.

For instance, Redwood is equal in strength to cypress, and slightly stronger than eastern cedars. This conclusion is the result of tests made by experts in the United States Forest Service.

Special Qualities—Preponderance of heart wood. Close, even grain. Lightness of weight. Strength. Absence of pitch and resin. Presence of *natural* preservative that permeates the wood. Fire resistance. Non-conductivity of heat or cold. Freedom from insect

or worm activities. Non-shrinking. Non-swelling. Non-coloring. Acid and alkali resistance. Odorless and tasteless. Unaffected by electrolysis.

These properties of rot and fire resistance, minimum warp and shrinkage, as well as lack of odor, and its close grain and easy woodworking texture, have created a wide demand for Redwood for many industrial uses, many forms of railroad construction and maintenance, and for industrial building purposes.

Growth

Redwood grows principally in the northern counties of California, on the Pacific slopes of the Coast Range. It is from this section that Redwood for commercial purposes is obtained. The Redwood used for commercial lumber is not the Sequoia Gigantea—the famous “Big Trees” in the National Parks of the Sierra Nevada—but is a different species, the Sequoia Sempervirens (Everliving). The trees are extremely large and attain great heights, varying from 150 to 350 ft. in height, and from 3 to 15 and sometimes 20 ft. in diameter. Growing very slowly, in a moist climate, they are known to have obtained ages up to from 2000 to 3000 years. The character, size, age and climatic conditions of Redwood growth are no doubt factors in its utilitarian advantages.

Conservation—Conservation is intelligent use. We are operating on that principle, not only in logging, where waste is reduced to the minimum, but in manufacturing, where, due to the completeness of our facilities and the demand for Redwood for such a wide range of uses, we are able to cut up and refine our lumber so as to utilize every part of the log, both high and low grades—even the sawdust and bark. This makes not only for conservation of timber but for service and economy to our patrons. This conservation and the ownership of so many thousands of acres of uncut timber, close by the mills, assure a plentiful supply of Redwood for many years to come.

Supply

The supply of California Redwood is ample for all the special uses for which this especially rich and flexible medium is best adapted. For although this timber grows only in California, and in California only within a narrow strip along the Pacific Coast, that strip contains thousands of square miles of territory, and supports, it is estimated, 70 billion feet of standing Redwood timber.

Mills, Facilities and Capacity

THE PACIFIC LUMBER COMPANY is the largest manufacturer and distributor of Redwood lumber. Our annual production capacity is now over 125,000,000 ft. of Redwood.

Owning many thousands of acres of the finest Redwood timber lands in Humboldt County, California, together with two large sawmills and planing mills located in Scotia, California, THE PACIFIC LUMBER COMPANY further enhances its production facilities by owning all the commercial, housing and recreational buildings in the town of Scotia, in which the employees live.

It has exclusive use of the Leaver drying kilns, invented and constructed by an officer of the company to assist nature in drying Redwood for industrial use, at the same time not disturbing the *natural* preservative that permeates Redwood.

In logging operations, sawmills, planing mills, storage yard and shipping plants, every modern mechanical device is employed.

Stocks and Shipments

Sawed and seasoned Redwood lumber of all sizes, together with a large variety of milled products, are continually carried in stock at the mills at Scotia—usually this stock approximates 75,000,000 ft. Production and shipping are facilitated by an electric overhead monorail system, which operates throughout the mills, yards and shipping houses.

Direct rail shipments to the middle west and east are now made via the Northwestern Pacific Railroad, whose tracks adjoin the mills.

A large stock of Redwood is also carried at our “quick shipment” depot, in Chicago, to supply middle west and eastern demands where time is a factor. Shipments can be made from Chicago, either in carload or less than carload lots.

Trade-mark

Wherever practicable, the registered trade-mark shown here is placed upon Redwood from THE PACIFIC LUMBER COMPANY, a mark to indicate to the trade and user that the product is the result of every refinement in the production of Redwood. In the cases where shipping tags are used, the trade-mark label is on the tags.



Sales Offices

All sales in the territory east of the Rockies are made by THE PACIFIC LUMBER COMPANY of Illinois.

Its general offices are in Chicago, in the McCormick Building, 332 South Michigan Avenue.

The Eastern territory is handled through the New York office, in the 40 Rector Street Building.

Sales in Pacific Coast territory are made from THE PACIFIC LUMBER Co.'s San Francisco office, 311 California street. A branch sales office is located in the Central Building, 6th and Main Streets, Los Angeles.

Painting and Staining

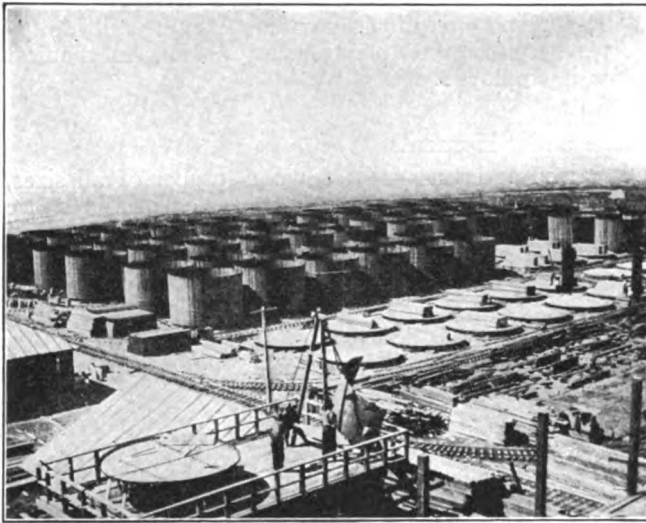
It is not necessary to paint or stain Redwood in order to make it durable; but those who prefer a painted or stained effect will find that Redwood will take any finish that any other wood will take, and some that no other wood will take.

Redwood is especially well suited to all kinds of paint and enamel work, because of its fine grain, smooth surface and the absence of resin or pitch. The freedom of Redwood from shrinking and swelling tends to insure against unsightly cracks in painted work.

Cost

Many people think that Redwood must necessarily be a high priced wood, on account of its being found only in California; but this is not the case. Because Redwood is lighter than other woods, when dry, the item of freight is consequently reduced.

Redwood sells at a price that, in spite of the high production and shipping costs, compares favorably with the cost of other woods which have been used for similar purposes, for most of which uses Redwood's unusual adaptability and lengthened service tends to further reduce the actual costs of material.



50,000-GAL. REDWOOD TANKS 24 FT. X 16 FT. 3 IN.
Plant of the Hercules Powder Company at San Diego, Cal.

Redwood Tanks and Vats

Redwood makes a superior stave for tanks.

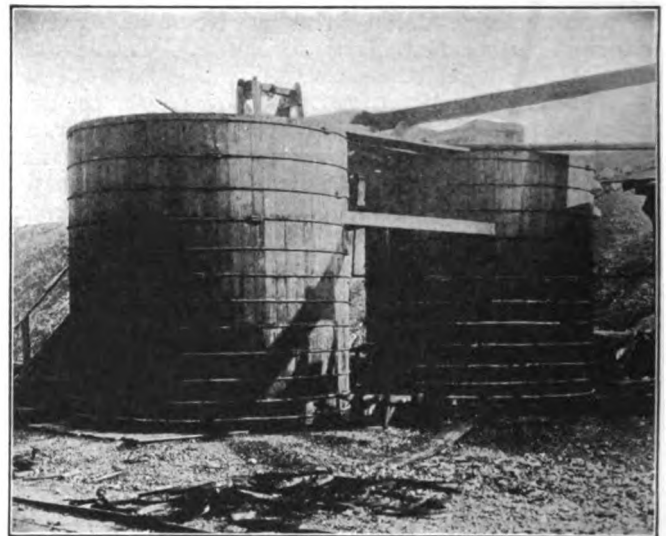
Redwood is a non-conductor of heat and cold; 2 in. of Redwood is equivalent in insulating power to approximately 30 in. of steel or concrete. This is an element of high importance in the stave for this use because it preserves the temperature of the contents of the tank.

Redwood staves are made from clear heart stock, and come in standard sets of 6 to 9 ft. and 10 to 20 ft. in length.

Redwood Tanks Used in Primary and Refined Production

The extraction, refinement and transportation of the world's supply of minerals, chemicals and fuel would be difficult without Redwood tanks.

Redwood tanks are used in copper mines, where strong solutions of destructive acids are necessary in refining processes; in chemical works, tanneries, breweries, soap factories and other manufacturing processes where the tank is called on not only to stand up under



REDWOOD TANKS USED FOR REFINING OILS FROM FATS
One tank is filled with hot water, the other with hot muriatic acid

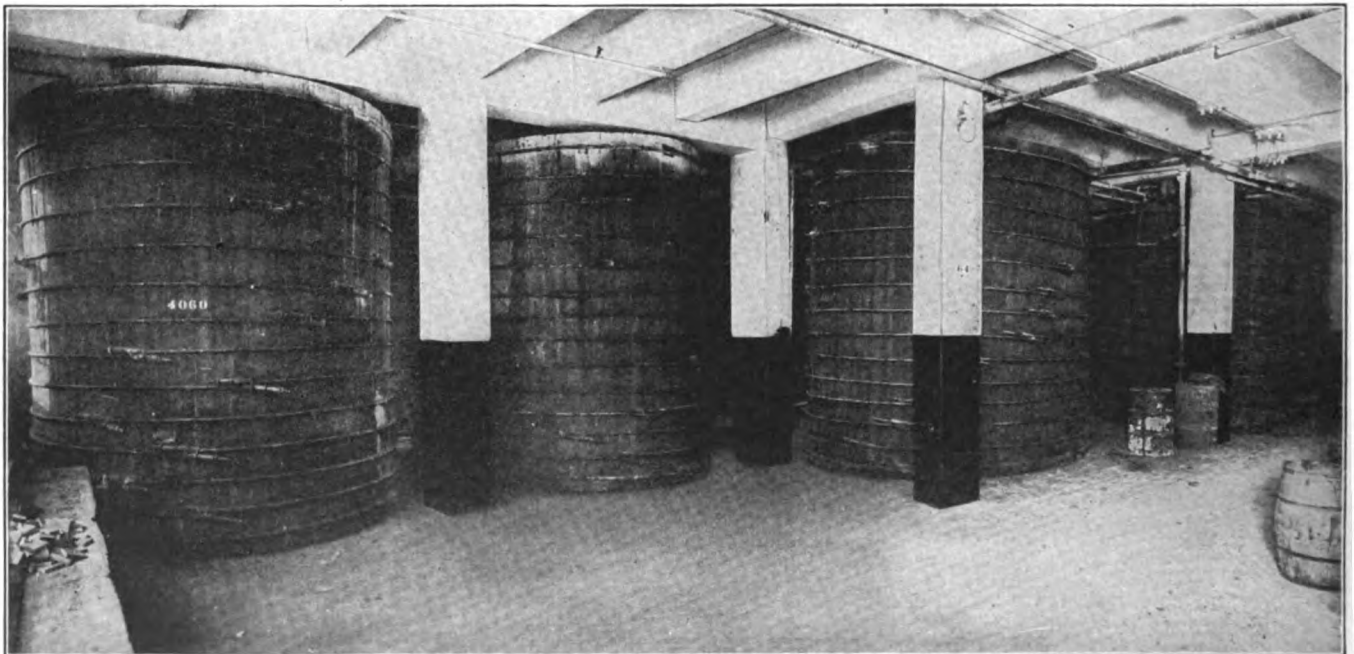
years of service, but remain unaffected by the contents. There are thousands of Redwood tanks in use for water storage, in wineries, for oil, fire protection, railroads, etc.

Redwood tanks will resist fire, are not injured or affected by arid climates or extremes of temperature. Redwood wears evenly under all sorts of service.

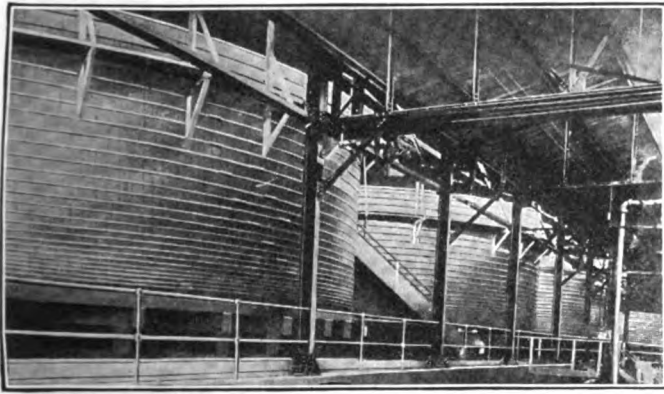
Redwood is the only tank material that meets such requirements as those of the Colorado Mining Company in the Philippines, where the white ant destroys in a few years any wood but Redwood. In the industrial centers of the busy mid-west and east, Redwood tanks are enjoying a growing prestige as the best containers for water, chemicals and oil in general manufacturing processes.

Redwood Tanks Resist Corrosion, Rot, Decay and Fire

The world-wide use of Redwood as a tank material is due to the unusual character of the wood, which contains a *natural* preservative that permeates the struc-



REDWOOD TANKS IN USE AT THE LARKIN CO. PLANT, BUFFALO, N. Y.
Ninety of these tanks now in use. Some used for rendering fats and some for settling tanks



50x12-FT. COPPER LEACHING TANKS OF REDWOOD
In the Anaconda Copper Mining Company's plant, Anaconda, Mont.



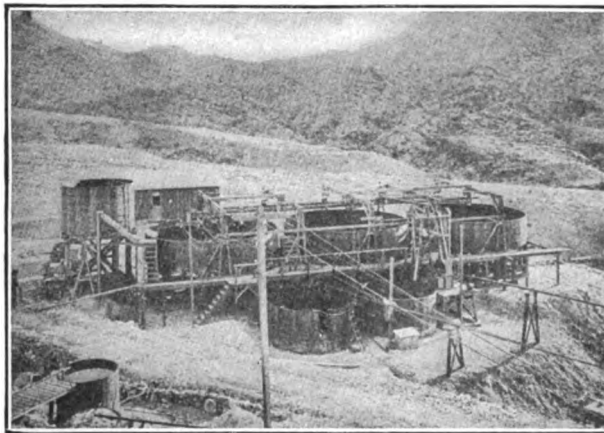
REDWOOD TANKS IN FOREGROUND
Eureka Hill Mining Company, Yankee, Utah

ture, making it unusually resistant to all forms of corrosion, rot and decay. And because of the absence of pitch and resin, Redwood is difficult to ignite, a poor food for flames and easy to extinguish. Moreover, its long, close, even grain, fine texture and lasting strength make it particularly adaptable to tank manufacture, while its cellular structure of innumerable small, regularly formed air cells, affords exceptional insulating qualities, as well as providing against shrinkage and warpage.

Redwood Tanks Unaffected by Hot Acid

Attention is called to the illustration on the preceding page showing two tanks used for refining oils from fats, a process requiring both hot water and hot acids. The Redwood tank on the left holds hot water, that on the right contains hot muriatic acid. The service given by these Redwood tanks establishes beyond question the value of Redwood tanks in chemical processes.

One of these Redwood tanks contained 12,000 gals. of muriatic acid for seven weeks maintained at a temperature of 180° day and night. Then 9,000 gals. were drawn off, leaving 3,000 gals. in the tank. Upon examination this tank was found uninjured after this service—about as severe a test as could be put to any wooden tank.



REDWOOD TANKS ON THE DESERT
75-ton cyanide plant of the Assets Realizing Mines Corp. at Blythe Junction, Cal.

The Fleming Tank Co., Inc., Pittsburgh, who installed the tanks for The Larkin Co., also shown on preceding page, received the following letter:

July 21, 1921.

GENTLEMEN:

"In reply to your letter of the 18th ult., the Redwood tanks which we purchased from you in 1907 are still in service and satisfactorily performing the function of storing fats.

"We cannot give you a comparison with cypress or white pine tanks as Redwood is the only wood which we use for this class of storage."

Very truly yours,
LARKIN CO., INC.

Average Life of Redwood Tanks is Higher than Other Woods

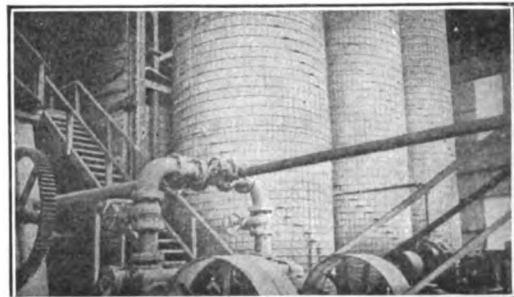
The following data as to the average length of life of wood tanks was contained in a paper read by C. R. Knowles of the Illinois Central R. R. before the American Railway Bridge and Building Association on October 15th, 1918:

AVERAGE LIFE OF 184 TANKS IN SERVICE

	REDWOOD	
Railroad "A"	77 tanks	Average life 32.6 years
Railroad "B"	29 tanks	Average life 28.3 years
Railroad "C"	25 tanks	Average life 25 years
Railroad "D"	3 tanks	Average life 32 years
	WHITE PINE	
Railroad "A"	24 tanks	Average life 29.7 years
Railroad "E"	12 tanks	Average life 35.4 years
Railroad "F"	4 tanks	Average life 29 years
Seven railroads; 184 tanks; average life 30 years.		



26x24-FT. REDWOOD TANKS
Installed at Pittsburgh Silver Peak Mill, Blair, Nev.



NINE WOOD STAVE PACHUCA AGITATION TANKS,
15 FT. DIAMETER X 45 FT. HIGH
Installed in large cyanide plant in Nevada

What Mining Companies Say About Redwood Tanks

HOMESTAKE MINING CO., LEAD, S. DAK.

"We have 16 Redwood Tanks 44 ft. in diameter by 9 ft. deep, which have been in continuous service with alkaline solution for 15 years and they are in first class condition. We regard them as the best and will continue to put in Redwood for all new construction of this character."

MINERAL PRODUCTS CORP.,
MARYSVALE, UTAH

"Replying to your inquiry regarding the service given by Redwood tanks wish to advise you that we have a great number of these tanks in operation at our plant and they give most excellent service. In fact we consider them to be without exception the very best tank material. They are of especial value in handling solutions of an acid nature."

TONOPAH EXTENSION MINING CO., TONOPAH, NEV.

"We have a number of Redwood tanks installed here and they have given perfect satisfaction."

ARIZONA COPPER CO., LTD.,
CLIFTON, ARIZ.

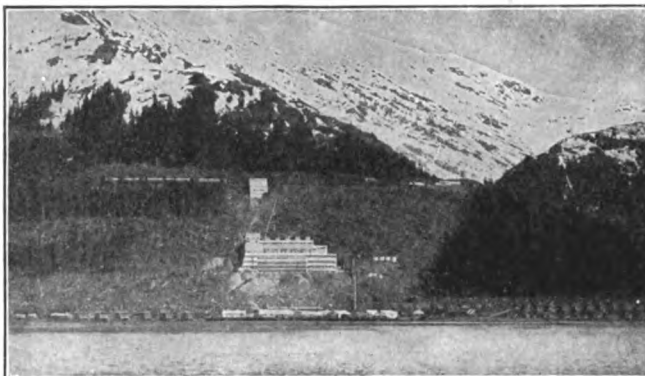
"The several Redwood tanks have given us entire satisfaction."

NEVADA HILLS MINING CO.,
FAIRVIEW, NEV.

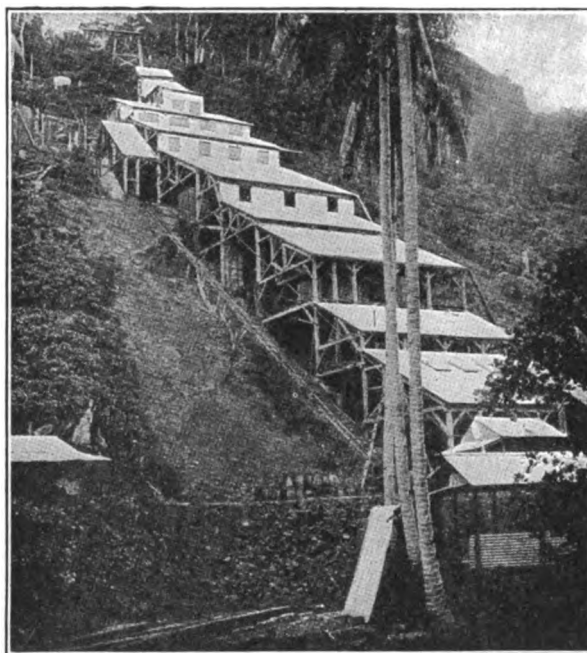
"The tanks have been in constant use since installation, April 17th, 1911, and have at all times given greatest satisfaction."

ENGELS COPPER MINING CO., KEDDIE, CAL.

"We have considerable experience with the use of Redwood, both in tanks and in pipe, and in both cases same has proved far more successful than any other kind of wood. There seems to be absolutely no decay to the wood and they give evidence of lasting a lifetime."



REDWOOD TANKS IN ALASKA
Alaska Gastineau Mining Co., Thane, Alaska, plant and town of Thane



REDWOOD TANKS IN THE TROPICS
Colorado Mining Company, Philippine Islands

WINNEMUCCA MOUNTAIN MINING CO., WINNEMUCCA, NEV.

"We are using Redwood tanks both for acid and saline solutions with the very best results."

NEVADA DOUGLAS CONSOLIDATED COPPER CO., LUDWIG, NEV.

"We can truly say that Redwood is far superior to any other wood for tank use."

COLORADO MINING CO., MANILA, P. I.

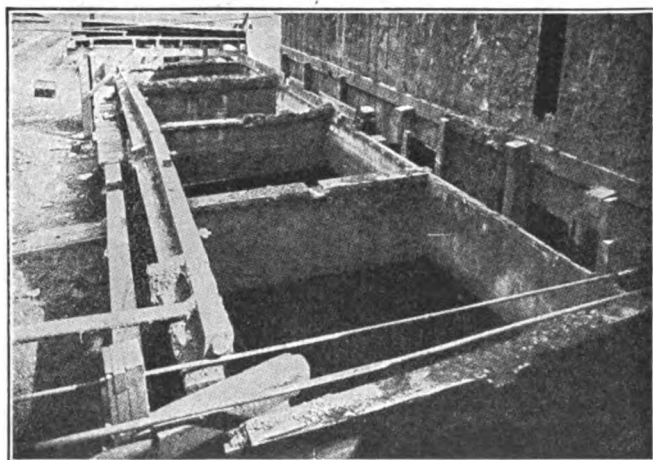
"All the wooden tanks installed in our Cyanide Plant located in the Philippine Islands have proved themselves satisfactory in every way."

JEWEL DENERO MINES CO., LTD.,
GREENWOOD, B. C.

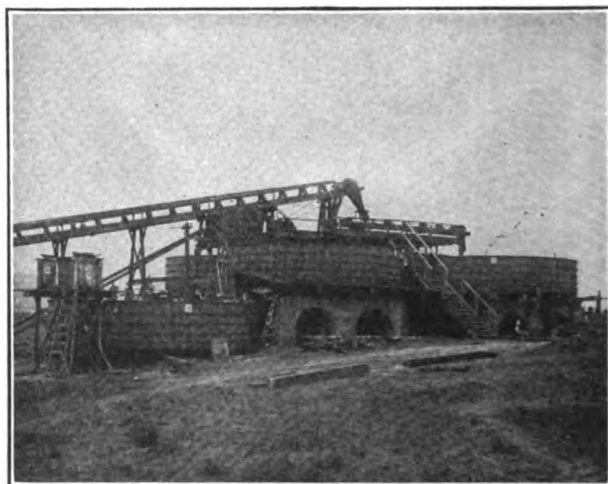
"We take great pleasure in stating that every tank has given entire satisfaction. We have used a number of tanks in New Zealand and found that they gave the same results. They are ideal for cyanide mill work."

GIANT POWDER CO., GIANT, CAL.

"During the year 1915 we had erected four 100,000-gal. Redwood tanks here at Giant, California. They have been thoroughly satisfactory and we have no reason to regret placing our order."



REDWOOD TANNING VATS IN USE SINCE 1852
Note the bored Redwood pipes for carrying solutions used in the tanning process



REDWOOD STAVE TANKS
Works of the Mountain Copper Co., Martinez, Cal.
Five 26 ft. x 6 ft. 4 in.

Redwood Water Tanks Are a Sound Investment

Utility, service and cost are the three considerations that should determine water tank specifications.

In first cost some tanks—both wood and metal—are slightly cheaper than Redwood tanks. But judged by the term of service and cost for upkeep, Redwood tanks are better and cheaper. Hoops may rust out and be repeatedly renewed while Redwood endures. Repair or replacement costs are minimized whether the service be 10 years or 30 years.

Following are nine good reasons for using Redwood water tanks:

(1) They are preserved by water and not rusted or corroded by it.

(2) They are not corroded by sulphur or mineral water and fumes.

(3) They are not destroyed by reasonably strong solutions of acids or salts.

(4) It requires less labor and expense to erect them than metal tanks.

(5) They are cheaper than steel or galvanized iron tanks.

(6) Their durability exceeds either steel or galvanized iron.

(7) They keep water cooler in summer and warmer in winter.

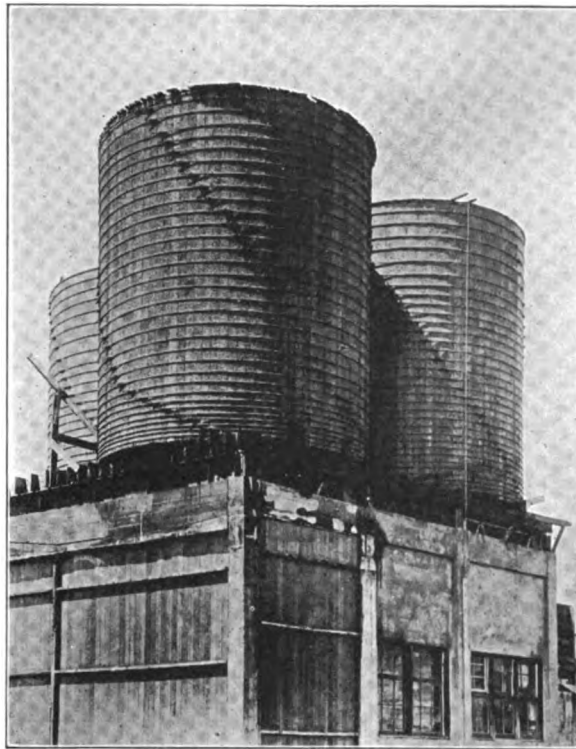
(8) They are easily taken down and reassembled at another point, which is not practical in the case of metal tanks.

(9) They are lighter in weight than other materials.

No protective treatment is required because Redwood is impregnated during growth with the *natural* preservative which remains in the fiber during the life of the tank.

Redwood is odorless and tasteless. It is unaffected by acids, alkalies or oils. Redwood tanks, pipes and vats are in continual use for supplying cities and institutions with water, tanning leather, dyeing textiles and for the strong solutions used in the leaching of copper. In all climates of the world Redwood tanks have been used for years, giving exceptional service.

A permanent tank is assured by the use of Redwood; one that neither rusts or rots, that remains tight and sound indefinitely, that does not affect the tanks contents and is not affected by them.



REDWOOD TANKS AFTER WITHSTANDING SEVERE FIRES

The two tanks in the foreground are of Redwood and were simply charred by the fire. The tank in the rear is a new tank made necessary because the old one which was of another wood was destroyed by the fire.



A 30,000-GAL. WATER TANK OF 3-IN. REDWOOD

Installed at the Pittsburgh Field Club for club water system, watering the greens and supplying water for swimming pool



A 15,000-GAL. REDWOOD TANK FOR SPRINKLER SYSTEM SERVICE

Erected on the roof of one of Pittsburgh's large department stores

Redwood Railroad Ties

The hardest possible usage to which wood can be subjected is the railroad tie.

It is not only in constant contact with the ground, but it must stand the strain and stresses of swiftly moving heavy trains. In his report on "Timber; An Elementary Discussion of the Characteristics of the Properties of Wood," to the Division of Forestry, U. S. Department of Agriculture, Filbert Roth, special agent in charge of timber physics, gives the following table on

THE RANGE OF DURABILITY IN RAILROAD TIES

	Years		Years
Redwood	12	Elm	6 to 7
Black Locust	10	Long Leaf Pine	6
Cypress and Red Cedar	10	Hemlock	4 to 6
Oak (White and Chestnut) ..	8	Spruce	5
Chestnut	8	Red and Black Oaks	4 to 5
Tamarack	7 to 8	Ash, Beech, Maple	4
Cherry, Black Walnut, Locust	7		

To get best service out of Redwood ties under heavy equipment, tie plates should be used.

Redwood ties have been in extensive use for many years in the United States, as well as in South America, England and the continent, Australia and the Orient. Because of Redwood's resistance to decay and freedom from attacks by destructive insects such as the white ant so common in the tropical countries, Redwood is in great demand in such countries.

Actual Performance of Redwood Ties

The two following letters from prominent railroad engineers give an accurate record of the adaptability of Redwood in railroad tie service.

SAN FRANCISCO, CAL., April 29, 1914.

DEAR SIR:

"Practically all of the tracks of the Northwestern Pacific Railroad Company, some 500 miles, are laid with Redwood ties. Many of the ties which were used in the original construction of the lines ultimately consolidated into the Northwestern Pacific, were in the track 18 to 20 years before removal. When built, 50- and 56-pound rail was laid upon these ties without tie plates. Upon tangents and upon branch lines where the traffic was light, some of these ties were taken out of the track at the end of 25 years practically sound so far as decay was concerned. However, through adzing on account of outer rail or curve rolling, and frequent re-spiking for gauge, the ties had become useless.

"In 1908, the Northwestern Pacific replaced old 56-pound steel between Cloverdale and Ukiah with heavy rail, and at that time many of the ties replaced were those laid in this track in 1889.

"At present, the Northwestern Pacific is using a 6x8 in. Redwood tie, with Harriman Lines' flat tie plate, 8x8½ in., weighing 6.36 pounds, and believe that such ties will give from 12 to 15 years of service except where laid on sharp curves. We are operating over this track ten-wheel engines with driving wheel load of 134,000 pounds, total loaded weight of engine, 176,000 pounds, and the tie plates in five years have no more than bedded themselves in the tie.

"Considering the durability of the wood, and with proper tie plate protection under rail of adequate weight and size for the power used, we believe a Redwood tie of the size above mentioned gives better service than a 7x9 tie of less durable woods."

(Signed) W. S. PALMER,
President and General Manager,
Northwestern Pacific R. R. Co.

SAN FRANCISCO, CAL., February 10, 1917.

DEAR SIR:

"Southern Pacific Company uses Redwood ties by preference to any other ties available on the Pacific Coast.

"Our ordinary consumption is from 750,000 to 1,000,000 Redwood ties per year, perhaps an average of about 900,000 for maintenance of track (tie renewals).

"With Southern Pacific Company rolling stock in use at present we always tie plate Redwood ties, and also tie plate other ties, excepting on unimportant branch lines.

"Some years ago when the weight on engine driving wheel axles was about one-half what it is now, we did not tie plate Redwood ties.

"The life of Redwood ties in track is variable as affected by decay, dependent upon the local conditions, character of soil and rainfall, etc., but the Redwood tie under any conditions is the most durable tie available here.

"I have known Redwood ties to be in use in main line track as long as 22 years, and the average Redwood tie under all conditions can be relied on with us for about 12 years, perhaps more."

(Signed) WILLIAM HOOD,
Chief Engineer,
Southern Pacific Company.

Car Siding, Stations, etc.

Redwood is splendidly adapted for car siding and roofing because it is sufficiently strong, light in weight, does not shrink, swell or warp, is hard to set on fire and burns very slowly, is not subject to wet or dry rot, and takes and holds paint perfectly.

The absence of shrink or swell is particularly desirable for car siding and roofing because of the travel of the car through varying climatic conditions.

Redwood is generally specified for railroad stations in the western country because of its extreme durability in contact with the ground and exposure to the weather, its satisfactory painting surface, and its fire resistance. Redwood is specified for such work to reduce the upkeep cost on small stations.

Use of Redwood by Railroads

Redwood's resistance to rot and its long life under extreme conditions of soil and climate are recognized by railroad, mining, and construction engineers, and Redwood is extensively used by them for a great variety of purposes. Redwood does not have to be treated with artificial preservatives to prolong its life. Nature impregnated Redwood with a natural preservative that grew into the wood. For engineering purposes in contact with ground or moisture, Redwood can be depended on to maintain its full strength and service from 15 years upward.

Some of the many railroad uses for Redwood are:

Railroad Equipment—

Siding, Ceiling and Inside Lining for Freight Cars	Baggage and Express Car Moulding, Casing, Lining and Sheathing
Refrigerator Car Roofing, Lining and Ceiling	Passenger Car Ceiling, Bottom Lining, Outside Sheathing and Panels
Stock, Box and Metal Covered Car Roofs	Window and Door Facing
Insulating Board and Wall Stripping for Powder Cars	Moulding, Sash and Cabinet Work
Boxing; Temporary Grain Doors	Eave Facia Moulding
Postal, Baggage and Express Car Lining and Ceiling	Sign and Letter Boards

Bridges, Culverts and Trestles—

Foundation Timbers; Cribbing, Cross Ties and Mud Sills	Concrete Forms; Water Pipe, Trestle; Caps, Posts, Sills
--	---

Buildings—

Foundation Timbers	Shingles and Cornice
Sheathing; Underflooring	Siding
Ceiling; Wainscot; Finish	Office Case Work

Roadway and Maintenance—

Ties	Cribbing
Fence Boards	Finishing Lumber
Flumes; Culverts	Road Signs

Posts—

Line and Lamp Posts (Electrical Department)	Sign and Signal Posts
	Fence Posts

Motive Power—

Locomotive Boiler Lagging	Patterns
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Signal Department—

Trunking, Signal Towers	Capping
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Tanks—

Water	Oil
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Redwood for Pipe and Flumes

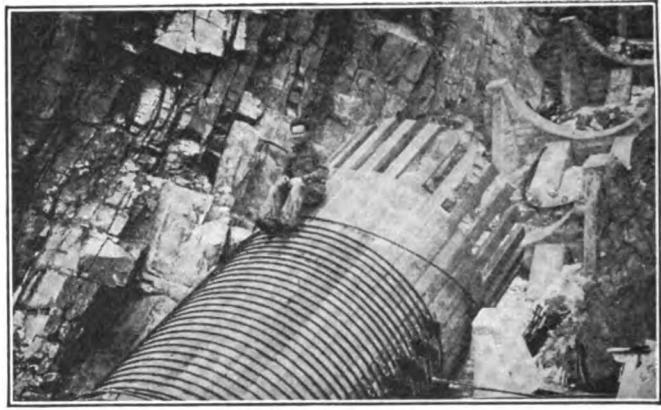
For pipe and flumes there is really no competition with Redwood, where permanency in installation and the highest type of service are demanded.

Redwood makes a superior stave for pipe. There are many Redwood stave pipe lines in operation today that have been in continuous service from 20 to 30 years, and show, under careful examination, no appreciable signs of decay. The average life of Redwood stave pipe is not definitely known. The original installations made in 1886, 1889, and succeeding years, are still in practically as good condition as when installed; and it is fair to assume that the ultimate life of a well built continuous stave Redwood pipe is from 60 to 75 years.

Redwood is a non-conductor; 2 in. of Redwood is equivalent in insulating power to approximately 30 in. of steel or concrete. This is an element of high importance in the stave for this use because it preserves the temperature of the contents of pipe.

Redwood staves are made from clear heart straight-grain stock, and come in standard sets of 6 to 9 ft. and 10 to 20 ft. in length.

On large installations the cost of Redwood pipe is about one-quarter of the cost of cast iron, and from 25% to 33% less than steel. At the then prevailing



8-FT. REDWOOD CONTINUOUS STAVE PIPE
Inverted siphon, U. S. Reclamation Service, Gilman, Cal.

"Continuous stave" installations can handle, in large pipe, a pressure head of about 350 ft.; and in smaller diameters it can be installed with strength sufficient to carry 400 ft. head. "Machine banded" pipe can be made with a guarantee to withstand a static pressure of 800 ft. There are lines in Nevada carrying 500 ft. head, which is 216 lbs. to the sq. in.

Comparative Advantages Redwood Pipe vs. Metal

Redwood pipe in service and cost offers these distinct advantages over metal:

Costs less than other pipe of equal efficiency.

Has a life equal to any other pipe except cast iron.

Will survive many replacements of steel hoops or wire bands even when the hoops or bands are heavily galvanized or coated with asphalt.

Carries from 10% to 20% more water than any other kind of pipe when both are new, and from 30% to 50% more when both are 10 years old.

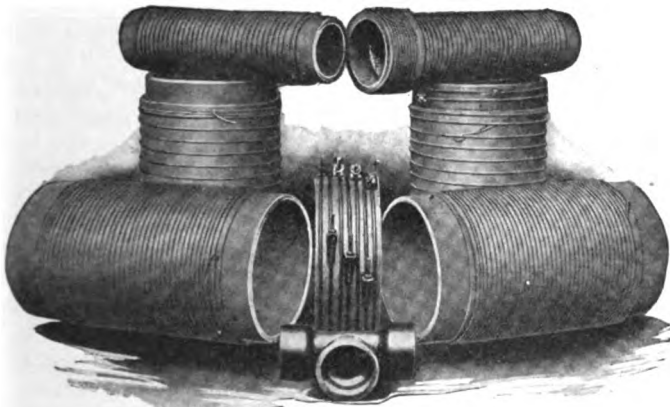
Flow capacity is not interfered with by accumulation of blisters and other foreign matter on the inner walls, such as in metal or concrete pipe, and which accumulation decreases the flow by increasing friction.

Not affected by electrolysis.

Not attacked by worms or insects, including the notorious white ant of the tropics.

Not affected by soils, which in many instances destroy other pipe.

Will not freeze under a temperature which bursts



MACHINE BANDED WIRE WOUND REDWOOD PIPE

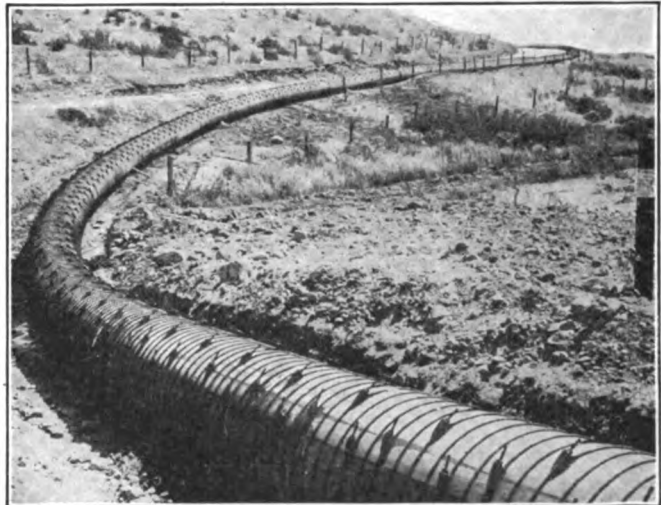
price of cast iron pipe (in May, 1917), a 24-in Redwood pipe line would cost about 25% as much as a cast iron line of equal size, while a 60-in. or larger cast iron pipe line would be entirely out of the question, as cast iron pipe is not made in such sizes.

Redwood pipe installations are made from 2 in. up to 13 ft. in diameter. It is made in two forms—"machine banded" and what is known as "continuous stave" construction.

"Machine banded" pipe is made in completed sections, in standard length of 6 to 20 ft., from 2 to 32 in. in diameter, and is shipped ready to be laid.

Redwood pipe is used as main lines for municipal water plants, penstocks for hydro-electric plants, in mines where drainage water is not only hot but carries mineral and chemical solutions detrimental to metal and other kinds of wood pipe; for sluicing, conduits, sewage disposal, irrigation systems, etc.

"Continuous stave" Redwood pipe is a built-up installation, and is usually used for lines above 20 in. in diameter and up to the largest size. It is shipped to the installation as staves. The stave arrangement is staggered and the ends splined. This gives a continuous pipe line that is best adapted for long lines conveying large volumes of water.



REDWOOD CONTINUOUS STAVE PIPE, OPERATING UNDER
100-FT. HEAD
Installed for the City of San Diego, Cal.

a metal pipe. If the water freezes, the flexibility of the pipe prevents bursting. It neither expands nor contracts with heat or cold, therefore does not require expansion joints.

Not afflicted with temperature cracks such as occur in cement or concrete pipe.

Water is not discolored, stained or tainted, and it remains cool, even when the pipe is laid on the surface in hot climates.

Redwood is a non-conductor of heat, and hot fluids and hot water can be pumped through it with a minimum of radiation.

Easily transported, particularly in rough or mountainous country, in "knock down" shape.

A Redwood pipe is the highest type of service durability. As the durability of Redwood staves is 5 or 6 times that of naked steel hoops, it is usual to protect hoops with asphaltic or other protecting coatings. There is no definite rule as to the life of the steel band on a Redwood pipe. That depends entirely on the soil that the pipe lies in. If it is salty it will attack the steel much more quickly than an installation in clay. In making Redwood pipe installations, the pipe companies investigate the bed for the pipe very thoroughly, and the pipe is equipped with protected hoops to give it the maximum life.

Redwood Fire Door Cores

Redwood is one of the four woods specified by the Fire Underwriters' Laboratories as a material from which fire door cores should be built.

Of these four woods Redwood is the first preferred, for these reasons:

(1) Natural resistance to fire because of slow ignition and slow burning.

(2) Absence of pitch resin, or other inflammable elements.

(3) Does not dry rot when denied ventilation.

(4) Will not "wet" rot due to moisture from sweating metal.

(5) Light in weight, strong and easy to work.

(6) Always hangs true, and is not affected by swelling or shrinking in the core by reason of moisture or dampness that might penetrate through steaming, sweating, etc.

In the State Housing Act of California, Redwood only is specified as a wooden fire resisting material for fire doors.

The following from Sections Nos. 58 and 59 of the Act effective September 1st, 1921:

"In every tenement house or hotel hereafter erected, every boiler used for purposes of heating the building, using fuel other than gas, and every heating furnace or water heating apparatus, using oil or other fluid fuel, shall be installed in a room.

"Any door in the wall of such rooms, shall be a fire resisting door, constructed of three thicknesses of $\frac{3}{4}$ in. by not more than 6 in., tongued and grooved, matched Redwood boards entirely covered on the sides and edges with lock-jointed tin; every such door shall be self-closing, so hung as to overlap the walls

of the room at least 3 in., and any glass in any such door or any glass in any window or opening in the walls of a boiler room shall be wired glass, not less than $\frac{1}{4}$ in. thick, set in a metal or metal covered sash."

Redwood Fire Walls

Redwood's slow ignition, slow burning, and the ease with which fire is extinguished have made it the recognized material for fire walls.

Experience on the Pacific Coast has demonstrated that a solid Redwood fire wall will perform its functions satisfactorily.

In the State Housing Act of California, effective September 1st, 1921, Redwood is specified as the only wood allowed for fire walls and ceilings. A portion of the Act reads as follows:

"In every tenement house or hotel hereafter erected any portion of such building, in which there is kept or stored any automobile or automobiles, shall be a room, the enclosing partitions of which shall be built of concrete, reinforced concrete, brick, stone, concrete tile or blocks, or terra cotta tile, not less than 6 in. thick or may be of wood studs lined on the automobile storage room side with Redwood Boards not less than $\frac{3}{4}$ in. thick covered with asbestos paper $\frac{1}{8}$ in. thick, and then covered with No. 26 (gage) galvanized iron, or such enclosing partitions may be constructed of studs lathed on both sides with metal lath and plastered with portland cement plaster not less than $\frac{3}{4}$ in. thick. Such enclosing partitions shall extend from the floor of the room to the ceiling of the same. The entire ceiling of such room shall be built of material or materials similar to that used in the construction of its walls, or shall be lathed with metal lath and be well plastered not less than $\frac{3}{4}$ in. thick. The floor of every such room shall be of concrete not less than 2 in. thick.

"Every door, window or other opening in the walls of buildings included within the district above described, shall be protected in the same manner as required by this act for doors, windows and other openings in a boiler room."

Building ordinance No. 399, of the city of Eureka, California, is typical of the permitted use of Redwood for fire wall purposes, and reads as follows:

"Sec. 2. The exterior walls and all party walls of the buildings included within the district above described, shall be constructed of concrete or brick, natural or artificial stone, or iron or a combination of any or all of the above described materials, or of Redwood as provided by this ordinance.

"Sec. 3. The height of all wooden buildings hereafter constructed within the fire limits shall be limited to 50 feet, from the sidewalk grade to top of fire wall or peak of roof.

"Sec. 4. All wooden buildings hereafter erected within the fire limits of the city of Eureka, except those built for, and used exclusively as dwelling houses, outhouses, and private stables, shall be constructed with solid walls, the same to be not less than four inches thick in all one-and two-story buildings, and in all three or more story buildings, the two upper stories shall be constructed with solid walls of like thickness, and the lower story or stories shall be constructed with solid walls not less than six inches thick. The above thickness of walls to be exclusive of plaster, weather boarding or rustic."

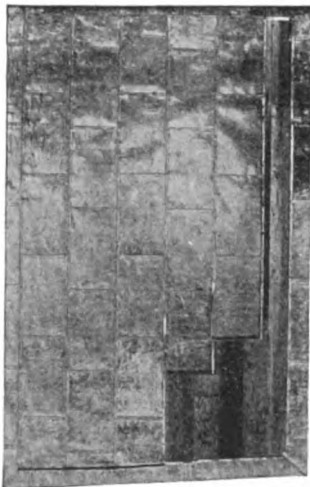
OAKLAND, CALIFORNIA.
April 11, 1917.

GENTLEMEN:

"With reference to your communication of the 7th inst., would advise you we have selected Redwood in many parts of our new building on account of the resistance this lumber has to decay and deterioration, and also on account of its resistance to fire. We particularly selected Redwood for our elevator shaft on account of the well-known resistance of this wood to fire. The construction of our shaft is 2" x 6" Redwood timbers placed on top of each other, making a solid wall of 6" thick.

"We gladly recommend this lumber to anyone desiring slow burning construction."

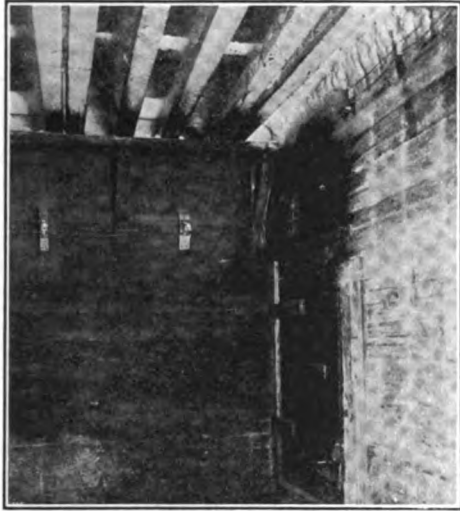
Yours very truly,
CALIFORNIA COTTON MILLS CO.,
Mgr. J. R. Millar.



FIREPROOF DOOR SHOWING
REDWOOD CORE
Approved by the Fire Under-
writers' Association

Insulating Qualities of Redwood Ideal for Cold Storage Requirements

Redwood cellular structure when studied under a microscope, looks very similar to a comb of honey



REDWOOD ICE STORAGE ROOM AFTER 15 YEARS' SERVICE

In plant of National Ice & Cold Storage Co., San Francisco. In spite of severe conditions of service, this room is still airtight, and there has been no decay in planking or timbers

between the dark annular rings. Every one of these millions of cells in the growing tree is full of sap, but when the tree is cut into lumber, the lumber must be "seasoned" or dried, before it goes into commercial use. This "seasoning" process consists merely of evaporating the natural moisture of these cells. Each cell, therefore, becomes a dead air space.

The cellular make-up of Redwood is uniform both in the thickness of the cell wall as well as the size of the cell. It is plainly evident, therefore, that heat applied to one side of a piece of Redwood, to travel through the Redwood must pass through a thin cell wall and then another dead air space, and so on. Heat passing through this combination rapidly dissipates.

Prof. L. J. Towne, of Columbia University, gives the relative power of conduction of 1 to 20 between wood and stone, cement or clay products. This means that stone and cement are 20 times a better medium for the conduction of heat or cold than is wood. The millions of dead air cells between the annular rings of Redwood are what give Redwood its insulating power.

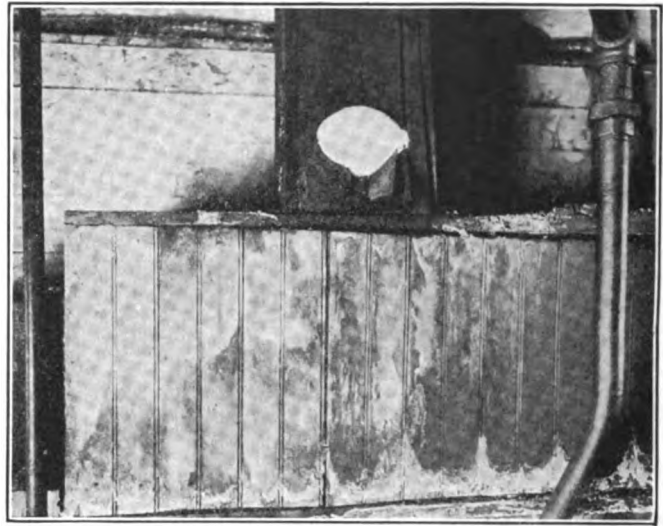
A large manufacturer of silos in the east, one of the pioneer concerns in the use of Redwood for silos, makes the statement that 2 in. of Redwood is equivalent to 30 in. of concrete in insulating power. This manufacturer has studied Redwood thoroughly from this angle for the reason that the success of a silo depends upon the non-conductivity of the silo wall—as dissipation of the natural heat of the silage through the silo wall increases the per cent of waste silage.

Installations of Redwood Insulation in Cold Storage Plants

Manufacturing plants use Redwood as a substitute for corkboard for insulating.

There are some splendid examples of Redwood's insulating power, as well as its remarkable longevity under the most severe service in the old plant of the National Ice & Cold Storage Co., San Francisco. This plant was built in 1902 and Redwood was used throughout. The system of brine casing is incased in Redwood boxes made of 1-in. matched and surfaced Redwood. Nearly all of these insulation boxes are still in use. The temperature in the brine pipes is 6° above zero, and

they have gradually built up around the pipe, inside of the box, an incrustation of frost that completely fills the box. In spite of the fact that the temperature of the inside of these boxes is 6° above zero, and the tempera-



INSULATING BOXES OF MATCHED 1-IN. REDWOOD AROUND BRINE PIPES

15 years old. Engine room temperature, 80°; inside of box, 5°. Frost formed around pipes is gradually forcing box out of shape, but there has been no decay, warp nor check in the wood. Insulating qualities shown by absence of frost on exterior of box

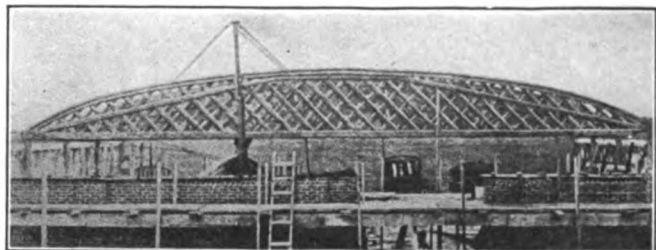
ture in the engine room of the plant is 80°, there is no shrink, warp, swell, twist nor check in these boxes, nor is there any gathering of frost on the outside of the box which would indicate free conductivity through the wood.

Not only this plant, but most of the icehouses on the Pacific Coast use Redwood as lining for cold storage and ice rooms. In the plant above referred to there are ice storage rooms that have been in continuous use for 15 years, and where Redwood has been incased with frost and ice for that period, and in spite of this severe service these rooms are thoroughly airtight—the joints of the wood are tight.

Lattice Roof Trusses

The wood lattice roof has been designed to meet the modern demand in industrial building for a light roof truss which can be built easily, quickly and at a low cost. The design is of such a nature that the truss can be built to span all ordinary lengths between walls without the need of intermediate supports, thus providing clear floor space in the building. Although light in weight it must be strong and constructed of material which can be obtained without delay.

Redwood's long life, resistance to fire, decay, and to corrosive acids make a Redwood lattice truss extremely suitable in construction where fire hazard, acid fumes, excessive moisture, or a combination of heat and humidity are present.



96-FT. REDWOOD LATTICE TRUSSES BEING ERECTED
Roof boards, also of Redwood, fastened directly to trusses

AMERICAN CREOSOTING COMPANY, INC.

COLONIAL CREOSOTING COMPANY, INC.
GEORGIA CREOSOTING COMPANY, INC.
INDIANA CREOSOTING COMPANY, INC.

LONDON OFFICE
4 Lloyd's Avenue, E.C.

GENERAL OFFICES
401 West Main Street
LOUISVILLE, KY.

SOUTHERN SALES OFFICE
BOGALUSA, LA.

PLANTS

LIVINGSTON MANOR, N. Y.
MANVILLE, N. J.
KANSAS CITY, MO.
BOGALUSA, LA.

PATERSON, N. J.
TOLEDO, OHIO
MARION, ILL.
DE RIDDER, LA.

ROME, N. Y.
RUSSELL, KY.
BRUNSWICK, GA.
HUGO, OKLA.

BLOOMINGTON, IND.
INDIANAPOLIS, IND.
SPRINGFIELD, MO.
SHREVEPORT, LA.

NEW HAVEN, CONN.

TRENTON, ONTARIO

SUDBURY, ONTARIO

OIL STORAGE STATIONS

CHALMETTE, LA.

BAYONNE, N. J.

ANTWERP, BELGIUM

Products

CREOSOTED MATERIALS, including Creosoted Cross Ties, Structural Timbers, Paving Blocks, Piling, Poles, Cross Arms, Fence Posts, Water Tanks, Silos, Lumber, etc.



LOWRY PROCESS
TRADE-MARK

proved scientific methods; fullest opportunity for plant inspection.

Lowry Process

A pressure and vacuum process for the efficient and economical treatment of wood, patented in the United States and Canada, insuring maximum and uniform penetration with final retention (according to specifications) of minimum quantity of creosote oil consistent with proper preservative effect; a system affording accurate gauging and recording of results.

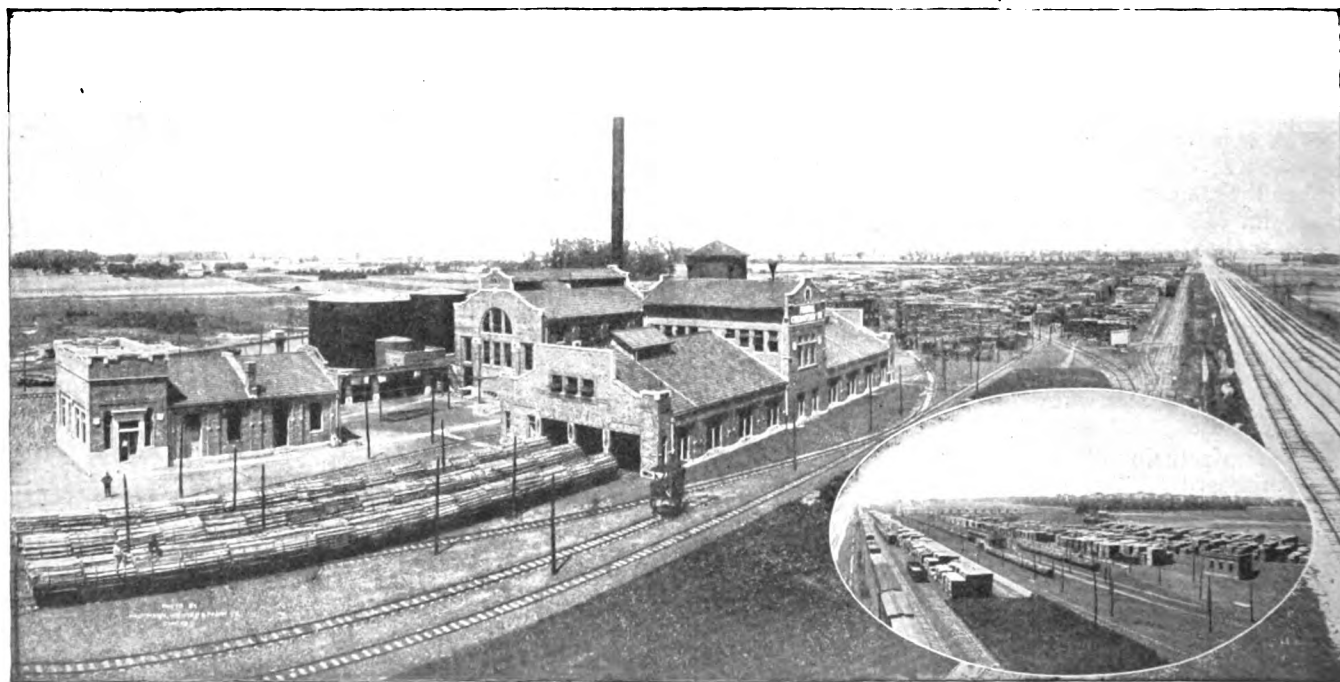
Facilities

Now supplying the treated tie requirements of over 32,000 miles of railroad; furnishing creosoted materials to the United States Government, states, counties and municipalities, and giving special service to the demands of construction engineers, traction lines, telegraph and telephone companies, factories, farmers and builders generally.

A record of 4,200,000,000 bd. ft. forest products treated since 1904; annual capacity now 500,000,000 bd. ft.; ample storage capacity for seasoning under ap-

Creosote Oil

Oil used is best obtainable grade of pure coal tar creosote oil, conforming to specifications of American Railway Engineering Association and American Wood Preservers' Association. Analyses furnished.



ONE OF THE PLANTS OF THE AMERICAN CREOSOTING COMPANY, INC.

THE WILLIAM BAYLEY CO.

Steel Windows for Industrial Buildings

SPRINGFIELD, OHIO

BRANCH SALES OFFICES

NEW YORK, N. Y., 110 West 40th Street
Telephone, Bryant 1311

BOSTON 9, MASS., 73 Tremont Street
Telephone, Haymarket 3285

CHICAGO, ILL., 6 North Michigan Boulevard
Telephone, State 7517

Products

PIVOTED VENT WINDOWS.

Also manufacturers of Continuous and other forms of Monitor Windows; Steel and Glass Side Walls and Partitions; Window Operators; Steel Doors.

Experience and Service

Bayley-Springfield steel windows are being extensively used in most American, and in many foreign, cities. Our success depends upon the service we render.

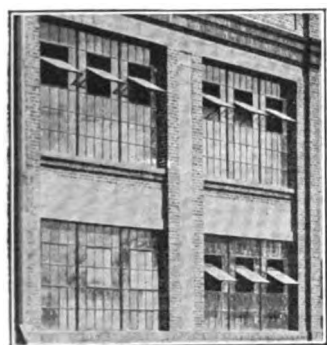
Write for illustrated descriptive booklets and for lists of installations.

Bayley-Springfield Warehouse Stock Windows

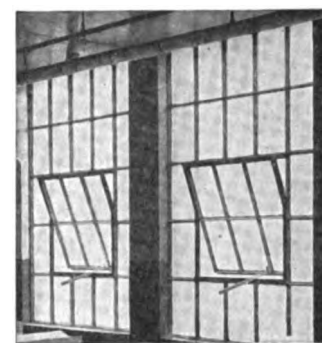
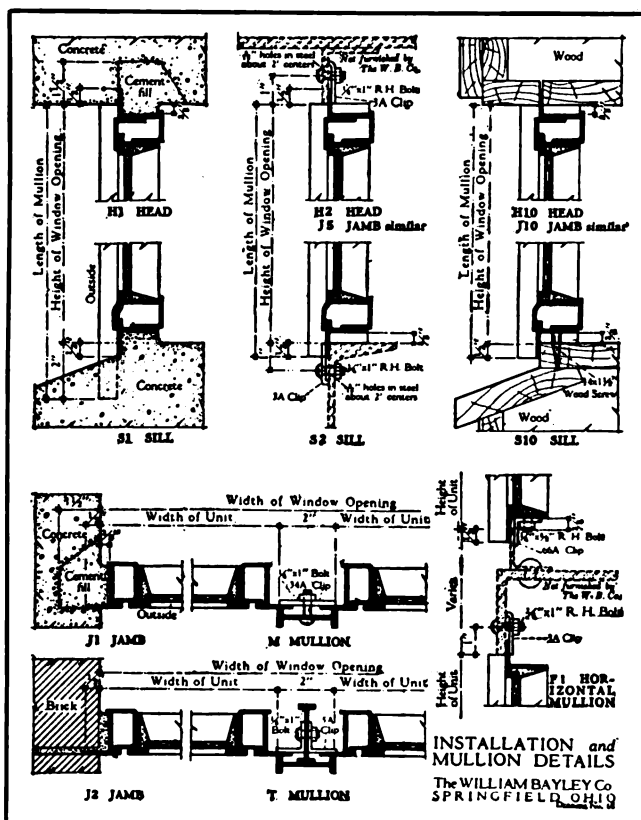
Thirty-three kinds and sizes, a variety sufficient in single and combination units to fill almost any desired masonry opening, and provide almost any required ventilation.

Horizontals and verticals are 11½ in. deep. Vents have double weathered contact, 1¼ in. deep at sides, and 1¾ in. deep top and bottom; are exceptionally strong and tight.

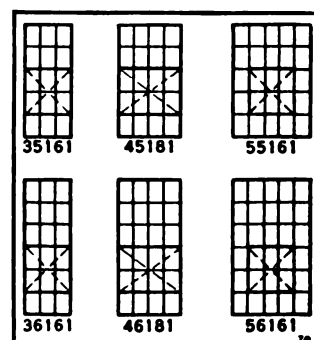
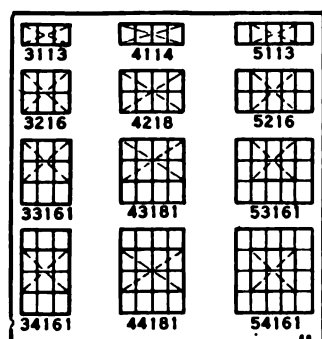
Glass sizes are 12x18 in. and 14x20 in. The latter is the more economical and, consequently, the more frequently used. Consult our engineers about window problems.



STANDARDS 56163 AND 55162



STANDARD UNITS 55161



UNIT LAYOUTS WITH VENTS INDICATED BY X MARKS ARE SHOWN HERE AT LEFT AND RIGHT
Warehouse stock also includes like units without vents

Bayley - Springfield merits are backed by a continuous manufacturing experience dating from 1881, and a steel window manufacturing experience dating from 1910.



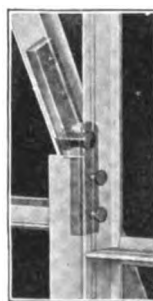
INTERSECTION OF MEMBERS



C CATCH



H CAM



PIVOT



VENT—STANDARD
HARDWARE



VENT—CHAIN
CONTROL

DETROIT STEEL PRODUCTS COMPANY

Manufacturers of Steel Windows

2250 East Grand Boulevard

DETROIT, MICH.

BRANCH OFFICES, AGENCIES AND WAREHOUSES IN PRINCIPAL CITIES

Products

SIDEWALL SASH, Center Pivoted, Top Pivoted (to open out) and Bottom Pivoted (to open in); CONTINUOUS SASH, Top Hung and Center Pivoted; COUNTERBALANCED SASH; CAMBER and CIRCULAR HEAD SASH; ECONOMY CASEMENTS; BALANCED REVERSIBLE VENT SASH; DETENTION SASH; PARTITIONS; DOORS.

Also Fenestra Continuous Operator, Fenestra Electrically Controlled Operator, Fenestra Worm and Gear Operator, Underwriters' Labeled Center Pivoted Sash, Underwriters' Labeled Counterbalanced Sash.



TRADE-MARK

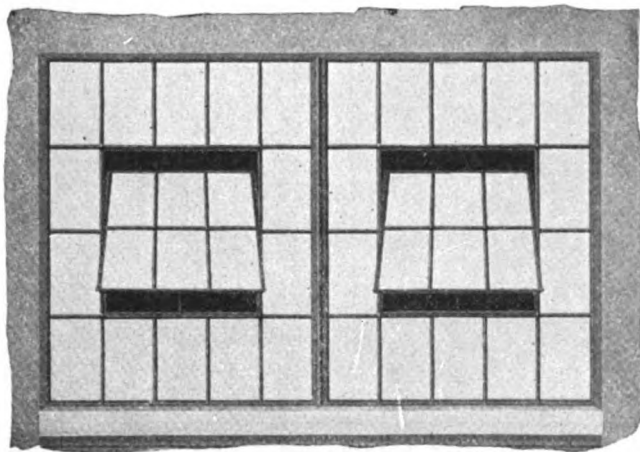
Catalogue

On request we shall be glad to mail complete catalogue of details and information on any of these lines.

Sidewall Sash

Fenestra WindoWalls construction is based upon the patented interlocking joint—30% more metal is retained at the intersection of muntin bars, making the sash unusually strong and resistant to wind pressure and vibration.

Ventilators are pivoted 2 in. above centers by means of external adjustable solid rolled steel butts, double riveted for strength.



SIDEWALL SASH

All ventilators are provided with solid rolled steel Z-bar brackets, triple riveted to the sill bar of the vent. Ventilators accessible from the floor are provided with cam latch and staybar; others are provided with cam latch, chain and pulley brackets, except those controlled by mechanical operating devices.

Complete details and methods of installation on request.

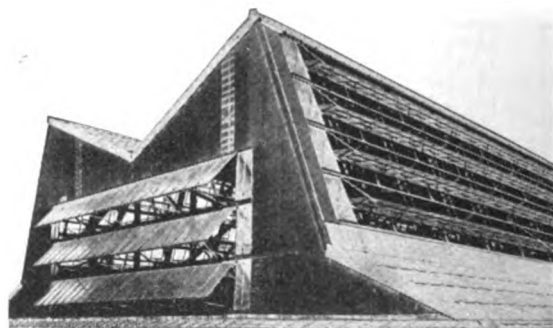
The following types and sizes carried in stock in numerous warehouses.

1 PANE HIGH Y HEIGHT 1' 7 1/2" Z HEIGHT 1' 3 1/2"			
2 PANE HIGH Y HEIGHT 3' 1 1/2" Z HEIGHT 3' 5 1/2"			
3 PANE HIGH Y HEIGHT 4' 9" Z HEIGHT 5' 2"			
4 PANE HIGH Y HEIGHT 6' 2 1/2" Z HEIGHT 6' 10 1/2"			
5 PANE HIGH Y HEIGHT 7' 0 1/2" Z HEIGHT 7' 6 1/2"			
6 PANE HIGH Y HEIGHT 9' 3 1/2" Z HEIGHT 10' 3 1/2"			
3 PANE WIDE Y WIDTH 3' 2" Z WIDTH 3' 0"			
4 PANE WIDE Y WIDTH 4' 2 1/2" Z WIDTH 4' 10 1/2"			
5 PANE WIDE Y WIDTH 5' 2 1/2" Z WIDTH 6' 0 1/2"			
Y=12' 10" GLASS Z=14' 20" GLASS COMBINE Y WIDTHS WITH Y HEIGHTS COMBINE Z WIDTHS WITH Z HEIGHTS			

TYPES AND SIZES, SIDEWALL SASH

Continuous Sash

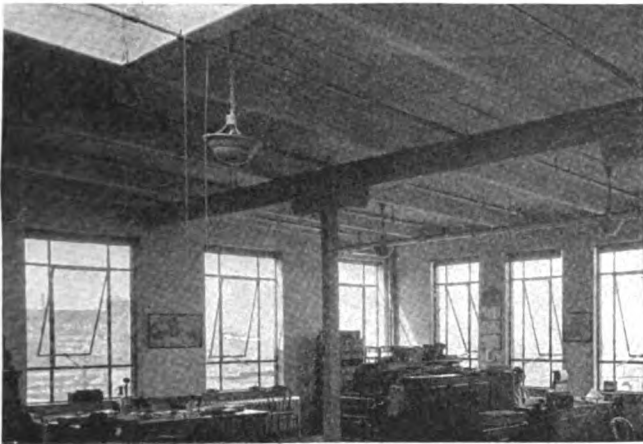
Both top hung and center pivoted continuous sash were used to secure proper ventilation in the Edison Lamp Works of the General Electric Company at Harrison, N. J.



CONTINUOUS SASH—EDISON LAMP WORKS OF THE GENERAL ELECTRIC CO., HARRISON, N. J.

Economy Casements

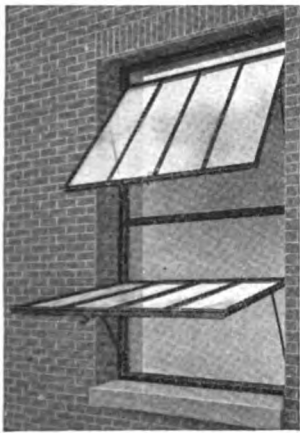
Fenestra Economy casements are particularly adaptable for office buildings. Easily screened and shaded. Large lights of glass. Ventilators controlled by Fenestra cam latch and staybar.



ECONOMY CASEMENTS

Balanced Reversible Vent Sash

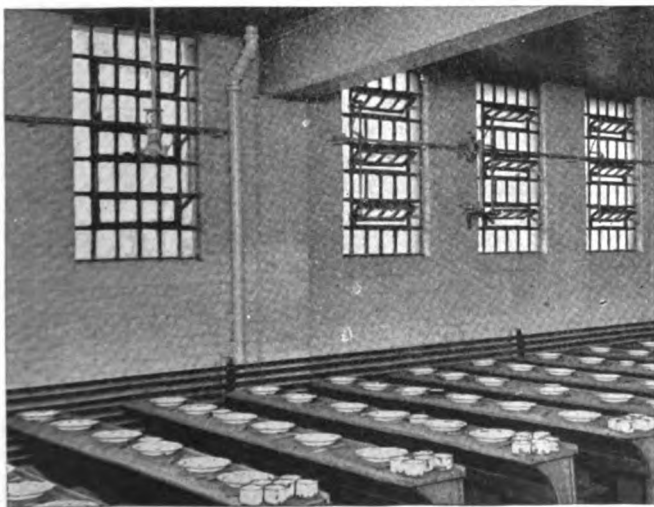
Extensively used in schools and public buildings. May be opened to any angle without the use of either staybar or chain. The balanced ventilator is easily reversed for washing from the interior of the building.



BALANCED REVERSIBLE VENT SASH

Detention Sash

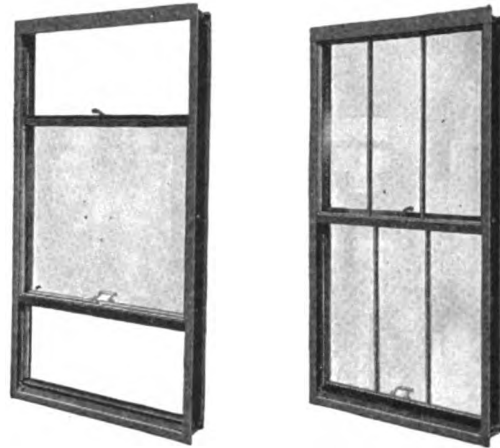
Fenestra detention sash combines the advantages of a good weathertight fire resistant window with the strength of steel gratings. 6x9-in. lights of glass, with 1 light high center pivoted ventilators, are used in the Detroit House of Correction.



DETENTION SASH, DETROIT HOUSE OF CORRECTION

Counterbalanced Sash

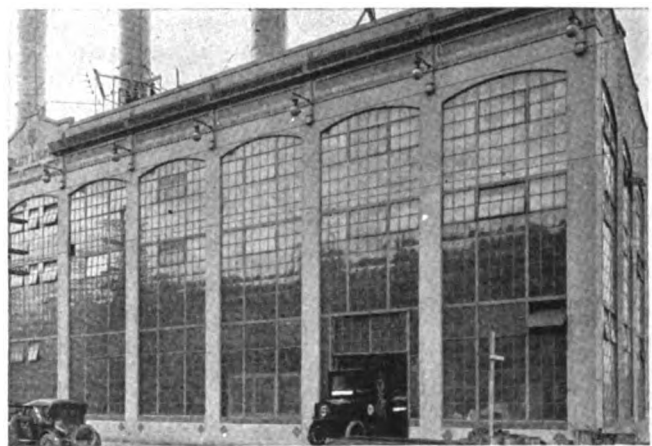
Two of the most popular types of Fenestra counterbalanced windows are shown below. Use of vertical muntin bars is largely a question of taste in the architectural effect that is desired. Easy to screen and shade.



COUNTERBALANCED SASH

Camber Head Sash

The auxiliary powerhouse of the City Light Plant, Seattle, Wash., is typical of the use of Fenestra camber head sash in combination with sidewall units in power plant design. Camber heads and semicircular heads have been standardized in heights and widths. Write for details.



FENESTRA CAMBER HEAD SASH, AUXILIARY POWERHOUSE, CITY LIGHT PLANT, SEATTLE, WASH.

Partitions

Standard units of Fenestra sidewall sash may be joined by our standard T-bar mullions to form very effective fire resisting partitions which have the advantage of being easily removed.

Write for details.

Doors

Fenestra single swinging and double swinging doors are manufactured in two types:

(1) Steel channel trim doors for openings up to 5 ft. wide or an area of 50 sq. ft. per leaf.

(2) Steel tubular doors for openings over 5 ft. wide or over an area of 50 sq. ft. per leaf.

Write for details and standard sizes.

Fenestra single sliding and double sliding doors are manufactured to the same standard sizes as swinging doors.

DAVID LUPTON'S SONS CO.

Steel Sash, Partitions and Doors

Allegheny Avenue and Tulip Street
PHILADELPHIA, PA.

SALES OFFICES

NEW YORK, N. Y., DAVID LUPTON'S SONS Co., 50 Church Street
CHICAGO, ILL., DAVID LUPTON'S SONS Co., 1114 Steger Building
PITTSBURGH, PA., DAVID LUPTON'S SONS Co., 1415 Oliver Building
BUFFALO, N. Y., DAVID LUPTON'S SONS Co., 824 Marine Trust Building
ST. LOUIS, MO., DAVID LUPTON'S SONS Co., 1633 Boatmen's Bank Building

CLEVELAND, OHIO, DAVID LUPTON'S SONS Co., 806 Sweetland Building
BOSTON, MASS., DAVID LUPTON'S SONS Co., 88 Broad Street
SAN FRANCISCO, CAL., WATERHOUSE-WILCOX Co., 523 Market Street
DETROIT, MICH., DAVID LUPTON'S SONS Co., 935 Majestic Building
ATLANTA, GA., DAVID LUPTON'S SONS Co., 1024 Candler Building
BALTIMORE, MD., WALTER S. BRAUNS, Munsey Building

Products

LUPTON STEEL SASH: Pivoted Type, Projected Type, Counterbalanced Type, Counterweighted Type.

POND CONTINUOUS SASH: Roof Type, Sidewall Type, Power House Type.

POND OPERATING DEVICE.

LUPTON STEEL PARTITION; LUPTON STEEL TUBE DOORS.

LUPTON ROLLED STEEL SKYLIGHT.

Also manufacturers of Lupton Double Hung Windows and Lupton Casements.

For Steel Shelving, Bins and Racks, see page 920.

Designing for Unusual Ventilation

For a number of years DAVID LUPTON'S SONS Co. has specialized in applying sash to difficult ventilating requirements. This practical study has resulted in evolving two forms of sash—namely, Lupton Counterbalanced Sash and Pond Continuous Sash—which give unusually effective ventilation.

Lupton Counterbalanced Sash has the upper and lower sash hung over a single pair of pulleys. This insures equal top and bottom openings as close to the ceiling and floor as possible, and makes it impossible for workers opening the lower sash to neglect the top sash.

Pond Continuous Sash accomplishes two purposes: First, it gives effective weather protection when open; its 20-foot units are connected in long unbroken lines outside of structural work, and the details prevent rain from entering at the top or ends. Second, it gives mass control of ventilation. One man can open more than a thousand square feet in a few moments by hand power, or several thousand if electric motors are used. Pond Continuous Sash was originally designed for sawtooth roofs, but was soon applied to foundry monitors, and to sidewalls.

The ventilating possibilities of Lupton Counterbalanced Sash and Pond Continuous Sash go much beyond what can be realized with conventional building designs. By planning the buildings so that the sash and the floor layout fit each other, results can be secured which would be impossible otherwise. The effect has been practically to rewrite the science of ventilation as applied to large industrial buildings.

The following principles govern the successful use of these sash:

(1) The balanced top and bottom openings of Lupton Counterbalanced Sash make it preferable for industrial buildings to pivoted or single hung sash. The average factory worker does not recognize "stale air," and opens the windows only if the temperature

becomes oppressive. In that case only the top or bottom sash is usually touched, though either alone is useless without a wind. By using Lupton Counterbalanced Sash the building may be made wider than usual, with reasonable assurance of fresh air reaching the center bays. In this way the rental charge is reduced and the sash becomes a profitable investment.

(2) The weatherproof details of Pond Continuous Sash adapt them especially to sawtooth and monitor roofs. Sash that must be shut for every shower are often left shut when they should be open.

(3) In certain industries Pond Continuous Sash is as useful in the sidewalls as in the roof. Among such are the rubber goods industry, foundries, chemical works, etc., where abundant ventilation is constantly demanded, and where entering rain would cause damage to equipment or product.

(4) Mass control of sash is especially desirable for large floor areas with many workers or heat-producing processes, since its practical effect is to place control in the hands of a responsible foreman who will attend to it. Instead of scattered workers each opening (or more likely neglecting) a few square feet of sash, one man should be able to open at least a thousand square feet at once.

(5) Where hundreds of workers are employed under a sawtooth or monitor roof, both inflow and outflow should be uniform for the entire floor. This is best done by operating Pond Continuous Sash in long lines or groups by electric motors, using Pond Operating Device, motor driven. Thus the air movement over many thousand square feet of floor may be regulated by a single switch; and by suitably locating switches, floor areas of any extent can be controlled from any desired points.

In designing a building to utilize the ventilating capabilities of the sash, the following points in particular must be observed:

(a) Inlet and outlet openings must be properly balanced. Either is useless without the other.

(b) A weak ascending air stream will not drag a long horizontal stream. Very wide sawtooth buildings are defective both in this and in the point just mentioned. Such air as enters from the side escapes before reaching the center if the roof sash be open, or remains stagnant if the sash be closed, as is too often the case.

(c) Where the roof is used, it must be formed to stimulate air movement. The sawtooth roof fails in this, because of the uniform level of its outlets; the conventional monitor roof fails to provide sufficient outlet in the right places, and the peak tends to pocket and

chill the air or gases. The Pond Truss roof avoids all three faults.

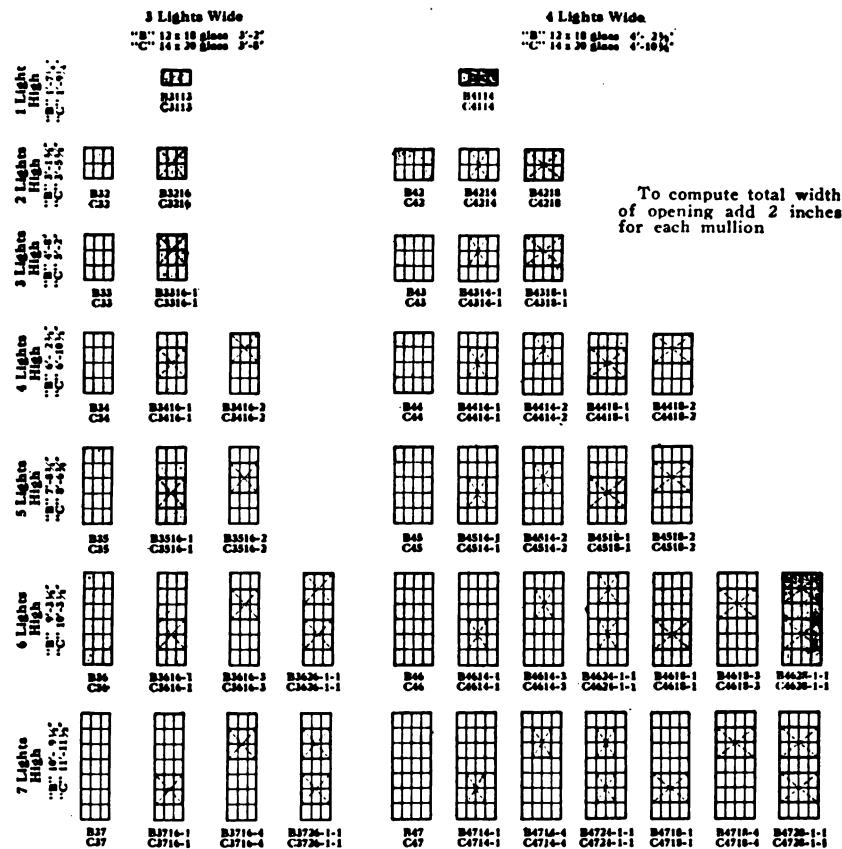
(d) Any heat-producing elements (furnaces, ovens, etc.) under a Pond Truss roof must be so located as to cause air currents to rise at or near the outlets. Inlets in the roof must be kept free from heat.

(e) With sawtooth roofs, especially where the workers are crowded or heat is produced, individual openings of sash result in "spotty" outflow, and therefore an irregular distribution of fresh air. The way to get uniform distribution is to operate the roof sash simultaneously in groups by electric motors, and to provide correspondingly uniform inlets in the side walls by means of Pond Continuous Sash suitably located and operated.

(f) For very wide buildings, the sawtooth and conventional monitor should not be used. The only effective way to ventilate the center is by alternate raised outlets and low inlets in the roof. Several such buildings, embodying the Pond Truss type for outlets, are shown on a following page. This roof gives also much better light distribution than the sawtooth, and is adapted to nearly all classes of industrial buildings. It usually costs less than a sawtooth.

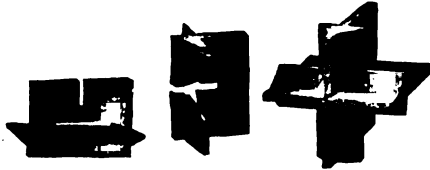
(g) The old conception of stale air rapidly escaping from small outlets is illusory and misleading. Rapid air flow can only result from a considerable difference in pressure. This difference, unless forced draft is used, can only come from a corresponding difference in temperature. The idea of treating a foundry or forge shop as a "chimney" can only be realized in practice by raising the inside temperature to an unbearable extent. The proper way to ventilate such buildings is to use large inlet and outlet areas, so that a slow movement is sufficient, and to locate them so as to produce that movement over the entire floor. For this, a correctly designed roof and correctly placed inlets are just as necessary as correct type and arrangement of sash. The Pond Truss roof was originally designed for foundries and forge shops, and has been found to accomplish its object perfectly.

This company does not design complete buildings or sell designs, but assists architects and engineers in every way to get maximum lighting and ventilating results from the use of Lupton products, maintaining a large engineering department, and adapting each design which is recommended to the individual requirements of the customer's business. No charge is made for this service, and architects and engineers are invited to use it freely.

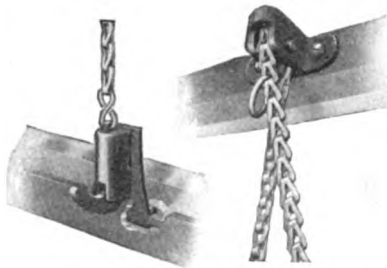


Lupton Pivoted Sash (Patented and Patents Pending)

Has certain features which are deemed fundamental, namely: solid one-piece rolled steel members, joints which resist corrosion and do not impair effective strength of sash, permanently weathertight ventilators and simple glazing. The members of Lupton Sash are specially rolled to give maximum strength without excessive weight. The muntin joints give maxi-



MUNTIN JOINT, LUPTON PIVOTED SASH



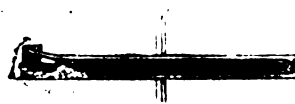
SPRING CATCH, LUPTON PIVOTED SASH
Showing pulley attached to top member of ventilator



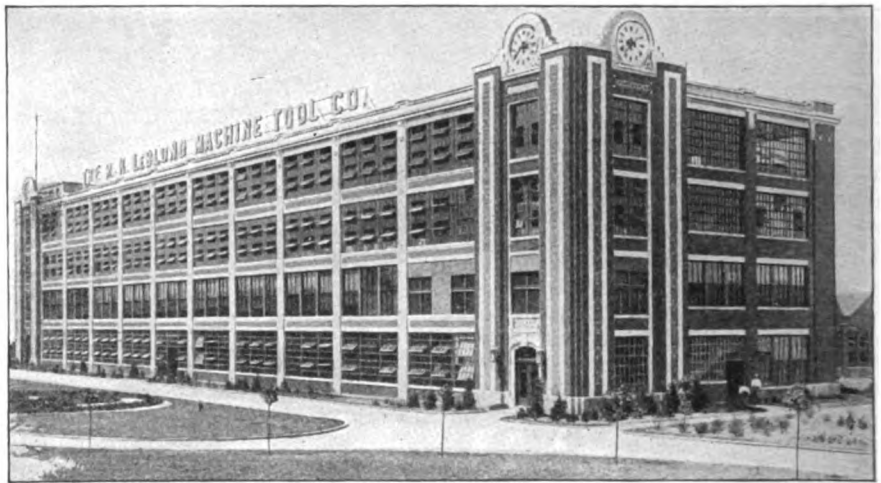
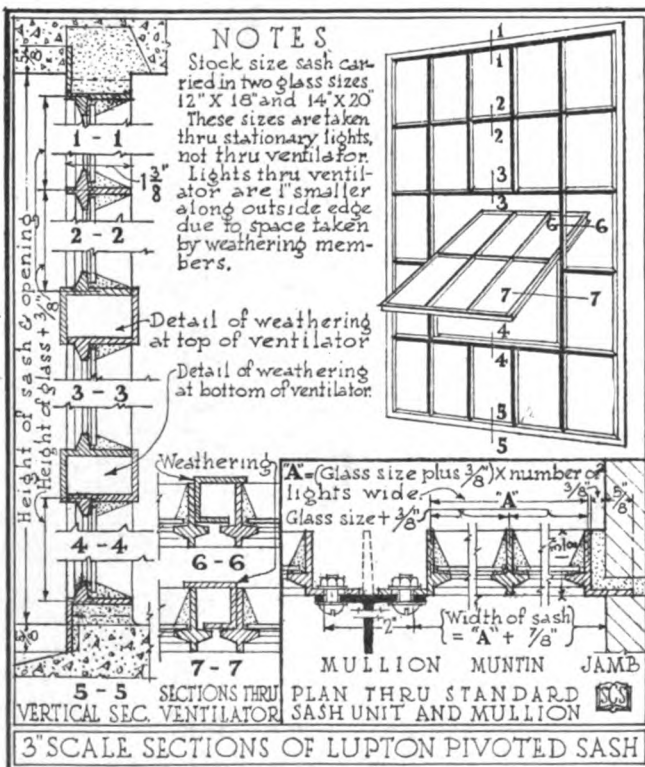
STATIONARY CLIP
To hold ventilator open

mum strength against wind, and are readily protected by painting. The muntins are fitted into frames and solidly riveted.

Ventilators make a close two-point contact at



PEG STAY, LUPTON PIVOTED SASH



LUPTON PIVOTED SASH APPLIED TO A WIDE BUILDING

all sides; when placed one above the other, they may be operated by a double arm connection, which closes them tight without slamming.

Standard and Stock Sizes—For quick delivery all commonly-used sizes of Lupton Pivoted Sash using 12x18-in. and 14x20-in. glass are carried in factory stock in the shape of pre-cut bars ready for assembling. Sizes most in demand are also carried in warehouse stock in various cities, fully assembled. Angle frame members and T-bar mullions are used.

The diagram on preceding page shows the "Standard" sizes. Those shaded are also classed as "Stock" sizes, and are carried in warehouse stock ready for shipment.

Lupton Counterbalanced Sash (Patented and Patents Pending)

Has upper and lower sash balanced over one set of pulleys, so that upper sash descends as lower sash is raised. Window units are made up to about 6 ft. wide and may be used singly or in multiple. All members are one-piece rolled steel sections. Sash members are solidly welded at corners. No horizontal muntins are used unless specified. Sills are made of copper bearing steel, and are shaped for minimum exposure of horizontal surface during rain, thus reducing cost of painting and tendency to corrosion. For offices, schools and hospitals sheet zinc weathering is furnished in jams and mullions at additional cost. Heavy chains and roller bearing pulleys are used. Glazing angle frames are recommended. Wind shields may be added if desired. Sash made to bear underwriters' label if desired, at extra cost.



LUPTON COUNTERBALANCED SASH

Pond Continuous Sash (Patented by Clarke P. Pond and Patents Pending)

The original continuous sash for mass-controlled ventilation. Used in monitors and sidewalls of foundries, forge shops and other heat-producing buildings to afford free escape for heated air and fumes; also in sidewalls where abundant and uniformly diffused inflow is desired. Used in roofs of machine shops, mills and factories to secure even, uniformly distributed outflow of stale air.

The most effective roof application is in the Pond Truss (see pages 199 and 200).

The top hung type is recommended. It combines greatest ventilation with protection from weather and minimum need for opening and closing. Also requires least steelwork for support. Standard units 20 ft. long. Hung under a continuous overhanging angle; connected by weatherproof expansion caps which give flexibility for unavoidable errors in alignment of steelwork. The ends overlap rain-excluding storm panels 2 ft. wide.

Opening widths are measured in even feet, plus 3 in. for clearance and end flashings. Standard end units from 10 to 18 ft. by even feet are furnished as needed. For opening heights see drawing B1.

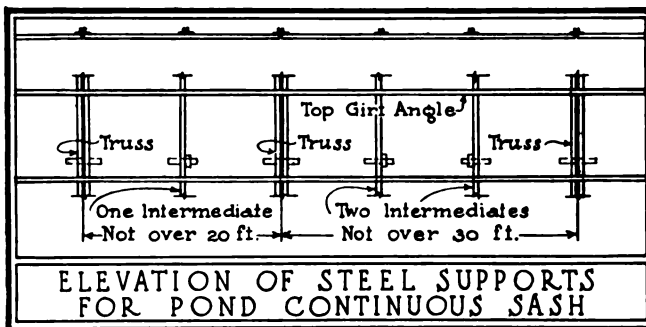
Pond Continuous Sash is controlled by the Pond

OPENINGS FOR TOP HUNG SASH CONTROLLED BY POND OPERATING DEVICE

No. 3 sash	3 ft. high	46°	28 in.	No. 5 sash	5 ft. high	42°	43 in.
No. 4 sash	4 ft. high	47°	38 in.	No. 6 sash	6 ft. high	36°	44 in.

Operating Device, which gives exceptional width of opening with minimum applied power. (See table.)

Length of runs may be from 150 to 300 ft. in vertical openings, depending on the height of sash (from 3 to 6 ft.). On a slope 30° from vertical, runs may be from 100 to 200 ft. By using spirals and counterweights these lengths of run may be doubled, and the motions required to open or close several runs correspondingly reduced. By using electric motors much longer runs may be operated. (See under Pond Operating Device.)



Construction is of heavy one-piece rolled steel sections oxy-acetylene welded at all joints; hence each section is a permanently rigid unit, and there can be no glass breakage due to loosening of joints. The flexible expansion joints above mentioned occur between lights, and eliminate all danger of glass breakage where sections are joined.

SECTION 1-1

SECTION 2-2

SECTION 3-3

SINGLE UNIT MULTIPLE UNIT

ELEVATIONS OF LUPTON COUNTERBALANCED WINDOWS

TABLE OF OPENINGS FOR COUNTERBALANCED SASH			
WIDTH OF UNITS			
NUMBER LIGHTS PER UNIT	GLASS WIDTH	OPENING WIDTH PER UNIT	
3	14"	3' - 9 1/2"	
4	14"	4' - 11 1/2"	
3	16"	4' - 3 1/2"	
4	16"	5' - 7 1/2"	
3	18"	4' - 9 1/2"	
4	18"	5' - 3 1/2"	
2	20"	3' - 6 3/4"	
3	20"	5' - 3 1/2"	
4	20"	6' - 11 1/2"	
2	22"	3' - 10 3/4"	
3	22"	5' - 9 1/2"	
2	24"	4' - 2 3/4"	
3	24"	6' - 3 1/2"	

HEIGHT OF OPENING			
LIGHTS	GLASS HEIGHT	OPENING HEIGHT	
2	36"	6' - 5 1/4"	
2	42"	7' - 5 1/4"	
2	48"	8' - 5 1/4"	
2	54"	9' - 5 1/4"	

Note: Width of Multiple Unit Opening is the sum of widths of units.

SECTIONS 4-4, SINGLE UNIT

SECTION 5-5

SECTION 4-4

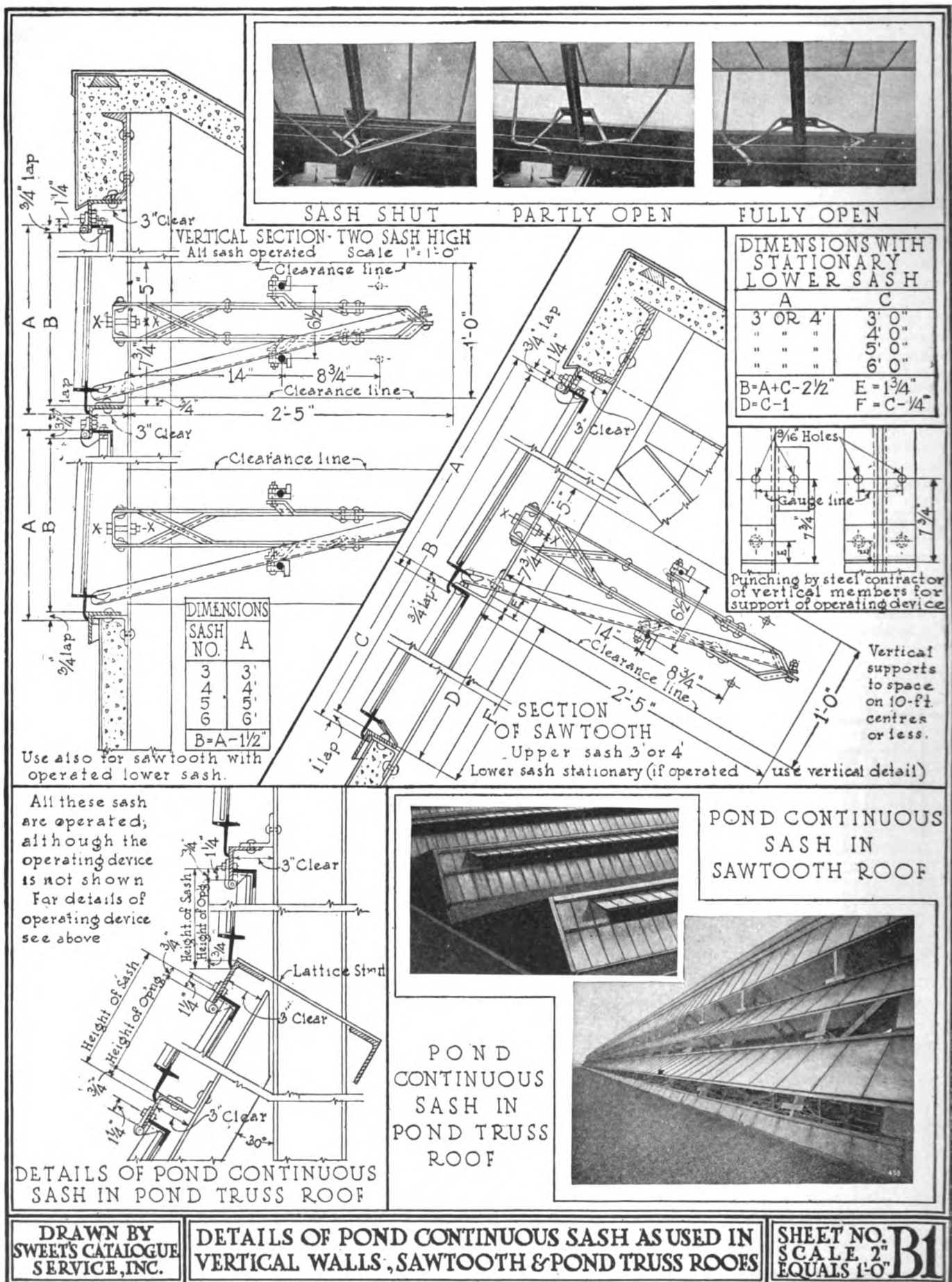
Showing Rolled Zinc Weathering

SECTION 5-5

SECTION 4-4

Without Rolled Zinc Weathering

3" SCALL DETAILS OF LUPTON COUNTERBALANCED WINDOW WITH & WITHOUT ZINC WEATHERING



Roof openings measure 14, 16, etc., feet wide, to any even number of feet desired—no inches. Between pilasters, ends of sash overlap weathering formed by Lupton to suit engineer's specifications, and set in brickwork. Opening widths are 10, 12, 14, etc., even feet, plus 3 in.



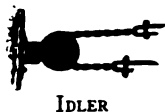
MACHINE SHOP WITH TWO PARALLEL POND TRUSSES IN ROOF AND POND A-FRAMES BETWEEN FOR ADMITTING FRESH AIR AND LIGHT

In sidewalls, Pond Continuous Sash may be used either in long lines outside of structural work, or in short lengths to fit window openings, and is operated in lines or groups, as desired, by the Pond Operating Device. In the former case sash lengths are in even feet; openings are the same plus 3 in. for clearance and end flashings. Storm panels may be used or omitted. In the latter case lengths may be standard or special, as required.

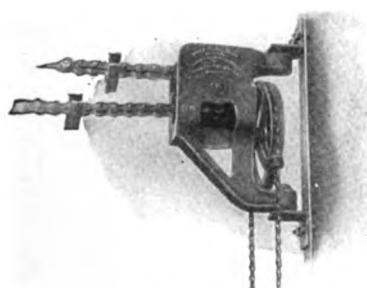
Standard units of Pond Continuous Sash and Pond Operating Device are carried constantly in stock in our Philadelphia, Cleveland and Chicago warehouses.

Pond Operating Device (Patented by Clarke P. Pond and Patents Pending)

Guaranteed to open long lines of sash wider, with less friction and wear, than any other device. It works



IDLER



POND OPERATING DEVICE WITH HAND CHAIN



SPIRAL AND COUNTERWEIGHT FOR BALANCING WEIGHT OF LONG LINES OF SASH

on the principle of tension transmission, increasing leverage as sash is raised. Will control any form of sash in long lines; but its advantages are most conspicuous with top hung sash. Power is transmitted by two lines of steel rods, connected by chains operating over a sprocket at one end and an idler at the other. These rods actuate sash arms through compound levers, the increasing leverage being due to varying angles of levers and sash arms.

All hinged connections are bronze bushed. Sprocket is driven by a worm gear and a hand chain. Worm gear is enclosed and runs in oil, hence has minimum friction and requires no attention.

For long lines of sash, a spiral and counterweight are advised in place of idler pulley. The varying radius of spiral balances the varying load of sash. By using a spiral, the practical length of line for hand chain operation is doubled; for shorter lines time required to open is reduced. With motor operation the use of spirals and counterweights gives uniform motor load and speed from shut to full open.

Pond Operating Device, motor driven, is recom-

mended for extra long lines, or for simultaneous control of several lines. It uses a 3-phase, 440-volt, 60-cycle alternating current motor, specially designed and furnished by this company. For long lines, special remote control switches are recommended and can be furnished at an extra cost.

Pond Continuous Sash, Power House Type (Patented and Patents Pending)

This type is recommended for power houses of all sizes. Its unusual strength of construction, the fact that it sheds water outside the build-

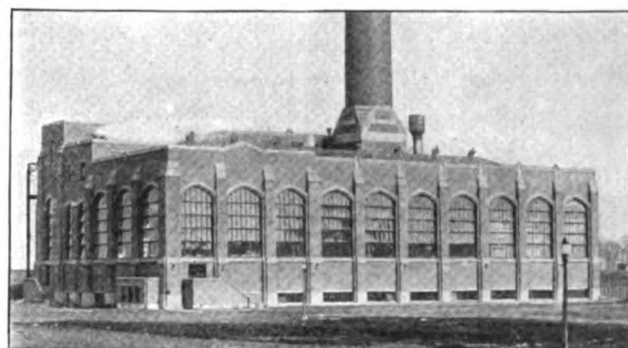
ing line, and the massive architectural effect of its large lights and wide imposts and mullions render it especially appropriate to this service. It uses Pond Continuous Sash of standard heights, 3, 4, 5, and 6 ft.; with lights 2 ft. wide and devoid of horizontal muntins. Details afford a continuous double weathering all around each sash unit at head, sill, jambs and mullions. Operation is by Pond Operating Device in groups, producing simultaneous control of all sash in an opening.

Two arrangements may be used, indicated on drawing A2 as A and B. "A" is used with external formed plate mullions. "B" is used without mullions in openings up to 16 ft. wide, and with interior structural mullions in wider openings. Mullions, where used, must be adequate both to carry the wind pressure against the sash and to support the weight of the sash.

In each arrangement, the sash are hung from supporting rails of formed steel plate; these are welded to the jambs, also to mullions in "A," and derive their entire support from these.

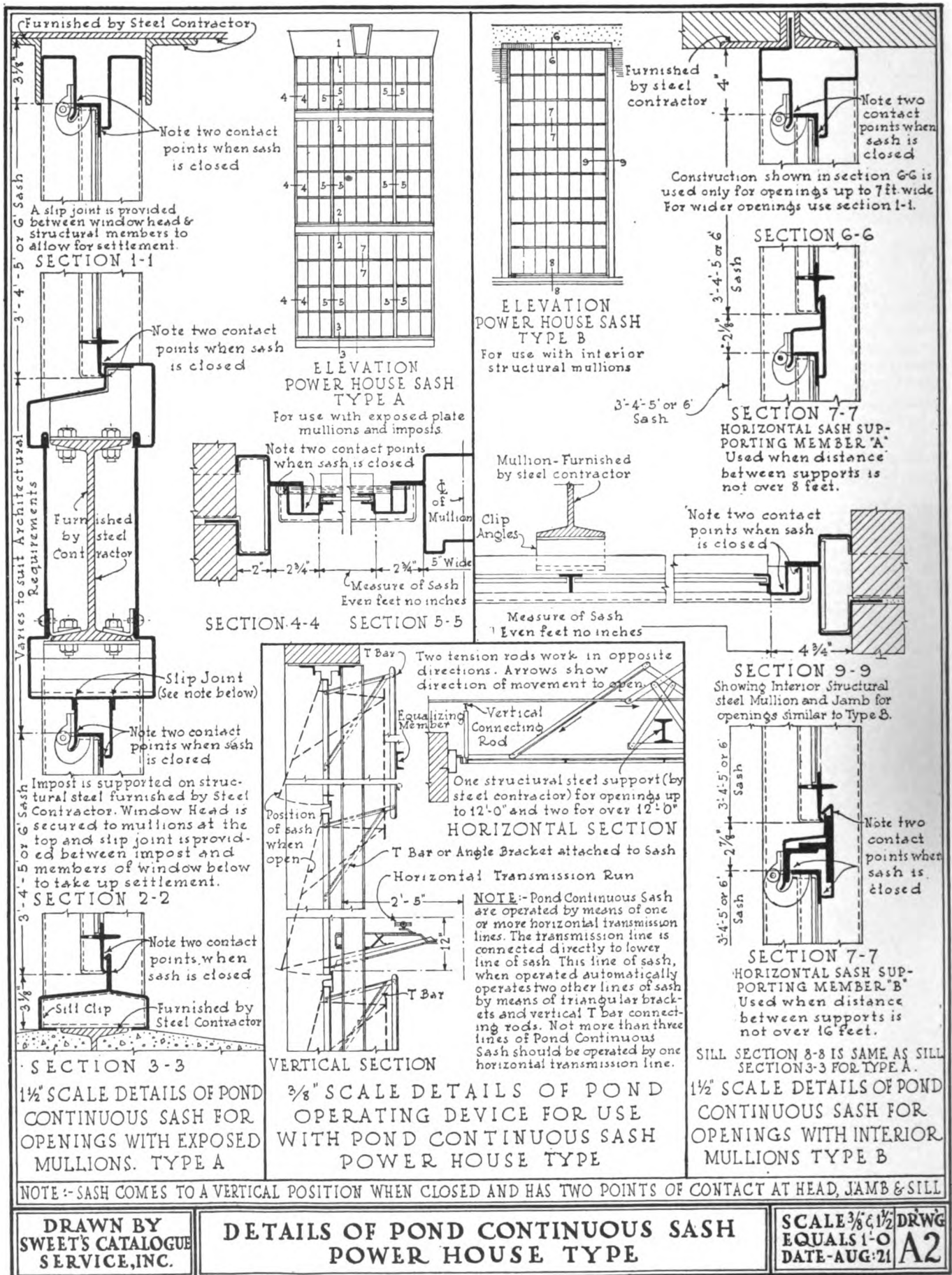
In "A," allowance is made for settlement of the masonry head by making the jambs, mullions and sash supporting rail a slip fit in the head. The same thing is done at the imposts, their function being to supply lateral wind bracing rather than vertical support. See details.

In "B" no allowance for settling is made, owing to the limited width of opening. A steel lintel of ample strength is assumed. For openings from 6 to 16 ft. wide, the intermediate sash supporting rails are stiffened with a T-bar and angle, as shown in the details.



POND CONTINUOUS SASH: POWER HOUSE INSTALLATION

The method of connecting upper and lower sash by vertical arms for simultaneous control by Pond Operating Device is also shown, together with clearances required by the Pond Operating Device. A heavy steel equalizing bar is attached horizontally to the vertical arms, and the sash hang partly open when free. This minimizes the effort to open or close. When closed, the sash are vertical, instead of slightly sloping like Pond Continuous Sash as ordinarily used.



Hand chains or electric motors are used according to the sash area which it is desired to control with one operator. (See paragraph on Pond Operating Device.)

For power houses of cheaper construction we furnish Lupton Pivoted Sash, arranged for structural steel jambs and imposts and with special grouping of ventilators, each the full width of sash, for simultaneous operation by Pond Operating Device.

Pond Truss (Patented by Clarke P. Pond)

For foundries and other industrial buildings, Pond Truss construction allows the use of one-story buildings of practically unlimited width, with perfect light and ventilation throughout. If the building is of extreme width, two or more Pond Trusses in the roof are arranged to alternate with low fresh-air bays having inlet openings hung with Pond Continuous Sash, or with Pond A-frames over the low sections of the roof. These are lines of A-shaped frames, running the length of the building, on which Pond Continuous Sash are hung.

In industries where certain processes, such as assembling, require unusual skill or many workers, a Pond Truss Roof on a multistory building gives ideal conditions for that work.

The use of the Pond Truss design is licensed where Lupton products are exclusively used. Its correct use is a matter of experience, and each roof is specially designed. This company should always be consulted.

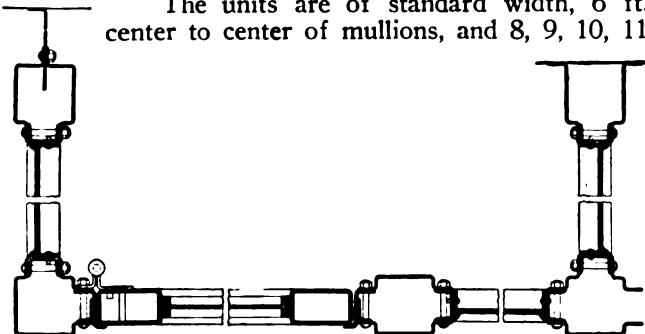


INTERIOR VIEW IN MACHINE SHOP WITH POND TRUSS ROOF SHOWING UNIFORM LIGHTING

Lupton Steel Partition (Patents Pending)

Special—Lupton Special Steel Partitions consist of units of rolled steel members, set in and supported by heavy plate steel framing.

The units are of standard width, 6 ft. center to center of mullions, and 8, 9, 10, 11



LUPTON SPECIAL STEEL PARTITION

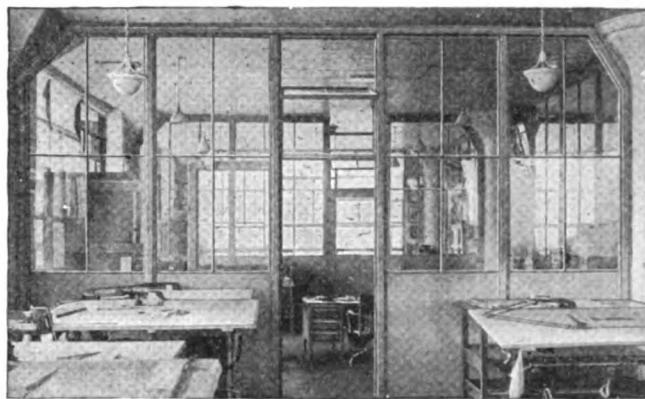
Horizontal section, showing interchangeability of section units, including door section. A door section may be moved, by interchanging it with a standard section

or 12 ft. high. Each unit has a base of steel plate 4 ft. high; the upper part is glazed or filled with wire screen.

Mullions are set over and conceal standards secured to floor. Both mullions and head rails are formed of No. 14 gauge steel plate to receive partition units.

All units of like size are interchangeable.

Standard—Lupton Standard Steel Partitions are made up of standard Lupton Pivoted Sash units, with channel instead of angle frame members, and with mullions of structural steel sections and formed plate. The doors are similarly made up from structural sections, bolted to formed plate and welded at the corners. This type of partition is intended for factory and warehouse use, and units have a limited interchangeability.



LUPTON SPECIAL STEEL PARTITION AND DOORS IN DRAFTING ROOM

Lupton Seamless Tube Doors

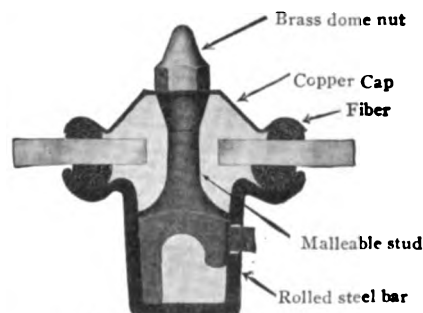
Made with stiles of seamless rectangular steel tube, welded at the corners. The lower part of door has a steel panel; the upper part is filled with glass or a steel panel as desired. These doors are made in all sizes from partition doors up to craneway and locomotive doors, and in many styles suitable for factory or office use.



LUPTON SEAMLESS TUBE DOORS
Horizontal section showing heavy formed steel jambs

Lupton Rolled Steel Skylight (Patented by Joash Brogden)

The construction of Lupton Rolled Steel Skylight prevents breakage of glass, leakage and corrosion. The glass is held between strands of specially saturated fiber, which permits some movement of the glass and eliminates leakage due to drying of putty. All exposed metal parts are non-corroding. Cap is of copper or galvanized steel, and both it and the bar are offset as required for overlap of lights. Condensation is carried by diagonal strands of fiber into the nearest bar, and drained to the roof by drip holes in the curb apron.



LUPTON ROLLED STEEL SKYLIGHT
Showing skylight bar, stud and cap, also method of holding glass

Literature

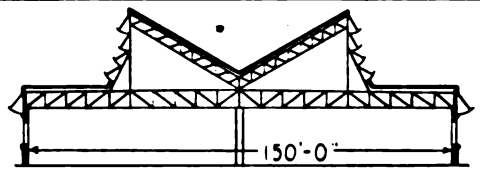
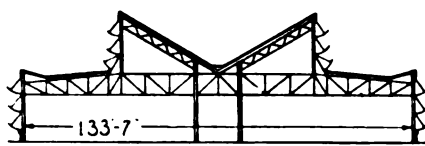
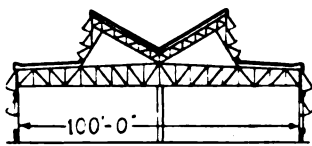
No. 11 Catalogue.
Air, Light and Efficiency (on Factory Design).
Air and Light in Foundries and Forge Shops.
Air and Light in Power Houses.
Air and Light in Machine Shops.



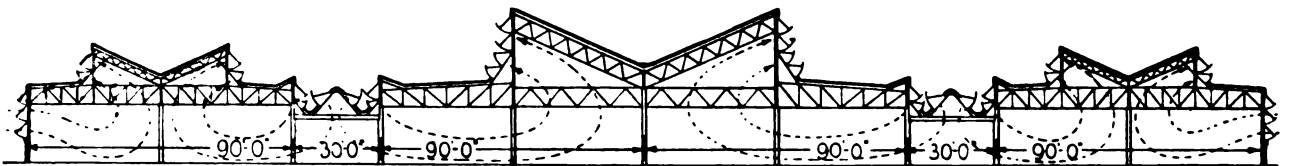
POND TRUSS OVER INTERNATIONAL HARVESTER CO. FOUNDRY, CHICAGO, ILL.



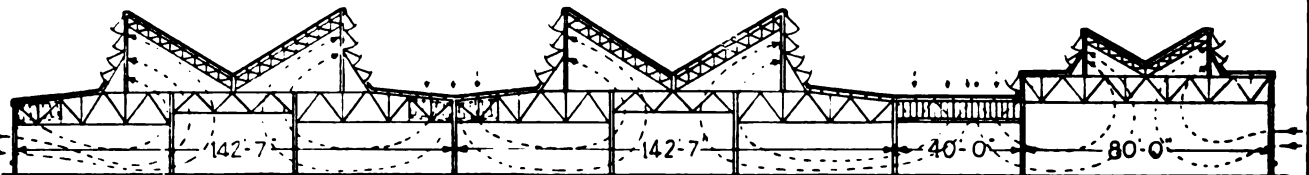
POND TRUSS OVER DAVID LUPTON'S SONS COMPANY FACTORY, PHILADELPHIA, PA.



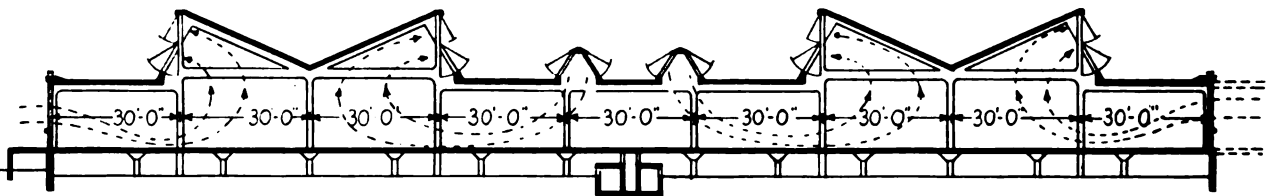
Sections showing the use of simple Pond Truss for ventilation and light.



Large Foundry: The dotted lines indicate how air enters at low sections in the roof and moves to areas where heat is produced.



Large Foundry: The dotted lines indicate how air enters at low sections in the roof and moves to areas where heat is produced.



Cross Section of Dayton-Wright Airplane Company's Building showing course of air currents. Two Pond 'A' Frames in center admit light and air.

IMPORTANT NOTE No attempt is made to give detailed information on these sections. The design of Pond Trusses for ventilation as well as light is an engineering problem to be solved for building.

DRAWN BY
SWEET'S CATALOGUE
SERVICE, INC.

**SECTIONS SHOWING USE OF POND TRUSS
FOR VARIOUS TYPES OF BUILDINGS**

SHEET NO.
NOT DRAWN
TO SCALE **C1**

TRUSCON STEEL COMPANY

Manufacturers of Steel Sash
YOUNGSTOWN, OHIO

BRANCH OFFICES IN THE FOLLOWING CITIES

ATLANTA, GA.
BALTIMORE, MD.
BIRMINGHAM, ALA.
BOSTON, MASS.
BUFFALO, N. Y.
CHICAGO, ILL.
CINCINNATI, OHIO
CLEVELAND, OHIO
COLUMBUS, OHIO
DALLAS, TEX.

DAYTON, OHIO
DENVER, COLO.
DETROIT, MICH.
EL PASO, TEX.
HOUSTON, TEX.
INDIANAPOLIS, IND.
KANSAS CITY, MO.
LOS ANGELES, CAL.
LOUISVILLE, KY.
MILWAUKEE, WIS.
TOLEDO, OHIO

MINNEAPOLIS, MINN.
NEW HAVEN, CONN.
NEW ORLEANS, LA.
NEW YORK, N. Y.
NORFOLK, VA.
OKLAHOMA CITY, OKLA.
OMAHA, NEBR.
PHILADELPHIA, PA.
PITTSBURGH, PA.
PORTLAND, ORE.
WASHINGTON, D. C.

PROVIDENCE, R. I.
ROSWELL, N. M.
ST. LOUIS, MO.
SALT LAKE CITY, UTAH
SAN ANTONIO, TEX.
SAN FRANCISCO, CAL.
SEATTLE, WASH.
SPOKANE, WASH.
SPRINGFIELD, MASS.
SYRACUSE, N. Y.

DEALERS EVERYWHERE

Products

TRUSCON PIVOTED SIDEWALL SASH;
CONTINUOUS SASH (top hung, center
pivoted, bottom hung and fixed types);
COUNTERBALANCED VERTICALLY SLID-
ING SASH; STEEL BASEMENT WIN-
DOWS; MECHANICAL SASH OPERATORS.

Also Underwriters' Labeled Sash; Doors and Par-
titions.

For Reinforcing Steel, see pages 91-93; for Steel
Buildings, see page 244.

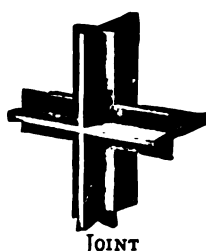
Truscon Service

Forty-two engineering service offices, familiar with
every phase of daylighting and ventilating, are located
in large cities in every part of the country for your con-
venience. This service is offered engineers, architects,
contractors, builders and owners without obligation.

Truscon Solid Steel Sash

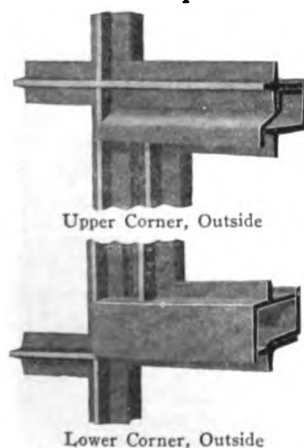
Construction—The highest type of steel crafts-
manship, both in design and workmanship, is represented
in Truscon solid steel sash—the result of twenty years'
experience in all phases of structural steel fabrication.

Joint—The intersection of the
horizontal and vertical muntins is
formed by a special dovetailed
mitered interlocking of the bars so
they run continuously from the head
to sill and jamb to jamb of the units.
This construction affords maximum
strength against wind pressure and
vibration common to industrial
buildings.

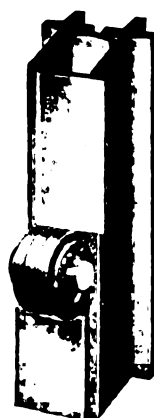


JOINT

Ventilator—Continuous double flat contact weather-
ing is used on all sides of the ventilator. Deep, heavy
rolled sections give added rigidity to the head and sill
and form a perfect drip. Standard ventilators are



Lower Corner, Outside



Inside View at Pivot

VENTILATOR

TRUSCON
STEEL SASH
TRADE-MARK

horizontally pivoted 2 in. above center
by means of solid steel butts. The
ventilators are accurately hung in the
shop so there is no adjustment in the
field. The butts are hung on solid
steel pins held in place with cotter pins,
thus doing away with bolts and nuts

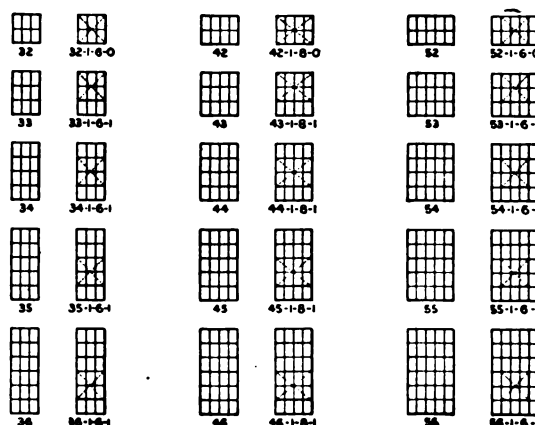
and so-called adjustable features.

Truscon Stock Sash—For convenience of the
architect and contractor, 33 of the most popular types
of steel sash have been manufactured in large quantities
and are constantly on hand at the plant at Youngstown,
Ohio, and other distributing points conveniently located
in every part of the country.

The sash are made entirely from standard Truscon
sections for 12x18-in. and 14x20-in. glass sizes. Side
bars are punched for standard Truscon mullions.

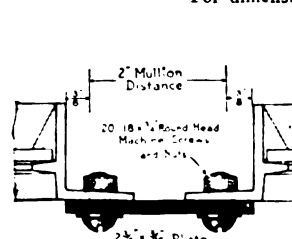
The types shown below are ready for immediate
shipment from any warehouse and by more than 100
dealers. Write for the name of the dealer in your
vicinity.

Dealers also carry Truscon steel basement windows
in stock in two sizes, each 3 lights wide, to accommodate
10x20-in. and 10x12-in. glass.

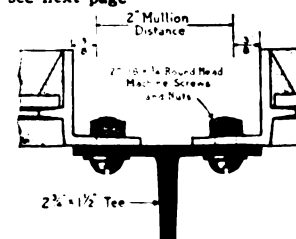


STOCK UNITS

For dimensions, see next page



Type T1 Mullion



Type T2 Mullion

STANDARD TRUSCON MULLIONS

T1 mullions are used with windows less than 6 ft. 3 in. high.
T2 mullions used with windows from 6 ft. 3 in. to 13 ft. 10 1/2 in. high.

Standard Units of Pivoted Sash—Large quantities of finished ventilators and machined muntin bars are carried in stock ready to be made up into standard

units. These are stocked in two glass sizes: 12x18 in. and 14x20 in. Ventilators are stocked in three sizes: 4, 6 and 8 lights. The standard members are assembled to meet the particular requirements of each building operation.

DIMENSION TABLES FOR STOCK AND STANDARD SASH
Single Units

Number lights high	Glass Sizes		Number lights wide	Glass Sizes	
	12"x18"	14"x20"		12"x18"	14"x20"
1	1'-7 1/4"	1'-9 1/4"	3	3'-2"	3'-8"
2	3'-1 1/8"	3'-5 5/8"	4	4'-2 1/4"	4'-10 3/4"
3	4'-8"	5'-2"	5	5'-2 1/4"	6'-0 3/4"
4	6'-2 3/8"	6'-10 3/8"	6	6'-3 1/4"	7'-3 1/4"
5	7'-8 3/4"	8'-6 3/4"	Be sure to combine 12"x18" heights with 12"x18" widths and 14"x20" heights with 14"x20" widths.		
6	9'-3 1/8"	10'-3 1/8"			
7	10'-9 1/2"	11'-11 1/2"			

Combining Truscon Units—Standard Truscon steel sash units of the same height dimension may be combined by means of standard mullions, in bays of almost any desired length. The diagram of the horizontal section shows two sash units in an opening. This is a standard layout showing the points from which the dimensions are taken. If more than two units are to be combined, add together the width dimensions of the sash units together with 2 in. for every mullion necessary. The vertical section at the left shows the points from which the heights of the sash are measured. The diagram below shows how widths are measured.

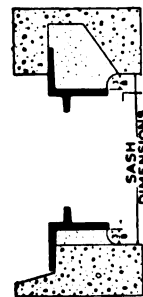


DIAGRAM OF HEIGHTS OF WINDOW OPENINGS

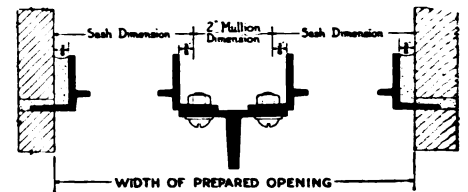
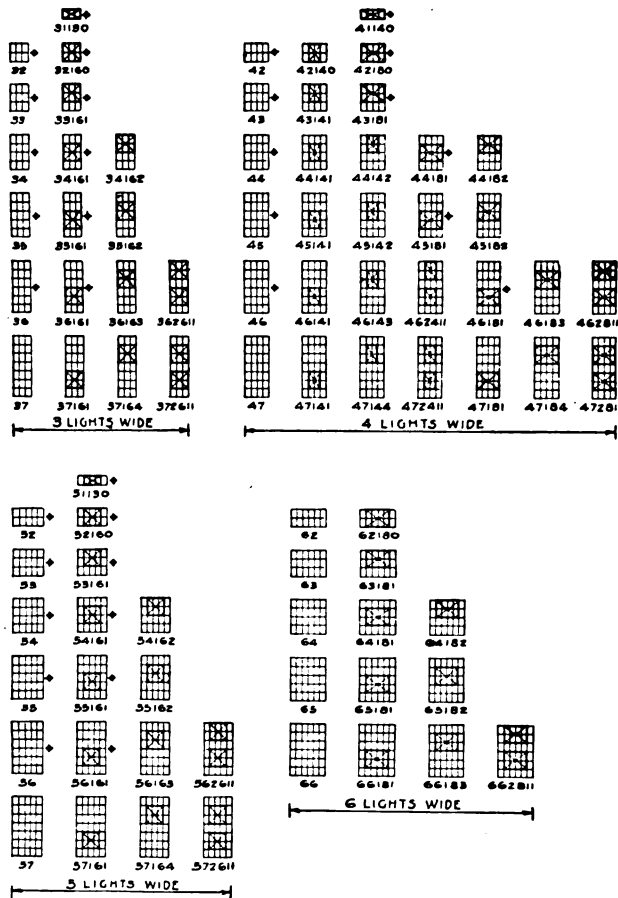
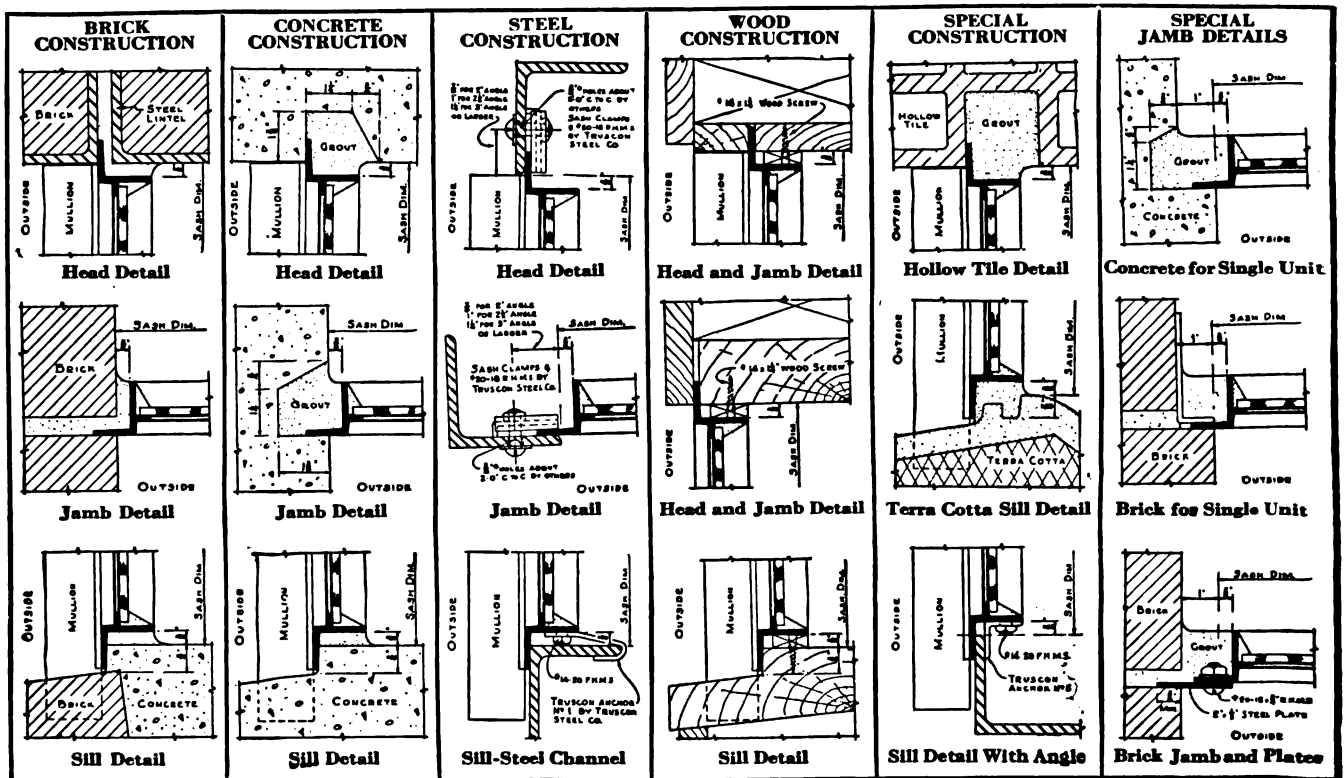


DIAGRAM OF WIDTHS OF WINDOW OPENINGS



STANDARD UNITS TRUSCON STEEL SASH
All sash marked (*) carried in stock for immediate delivery



INSTALLATION DETAILS FOR TRUSCON PIVOTED SIDEWALL SASH

Truscon Continuous Steel Sash

To meet the requirements of maximum ventilation and daylight in monitor and sawtooth roof construction, Truscon continuous steel sash was designed. This sash affords a long continuous opening in the roof or side-walls for ventilation, at the same time forming a glass canopy which gives ample weather protection so the windows may remain open even in the most inclement weather.

Truscon continuous sash may be installed with any type of truss design. In foundries, drop forge plants, heat treating and other types of buildings where the rapid expulsion of smoke and gases is essential, the sash units are often placed one above the other in long runs. Truscon continuous sash may be operated with equal efficiency in the vertical or sloping plane.

The sash are manufactured in three types—top hung, center pivoted and fixed lights. The requirements of every building vary with the manufacturing needs. For this reason the engineer or architect should consult one of Truscon's forty-two engineering offices located in the principal cities of the country before making plans and layouts. The services of these offices are yours without the slightest obligation.

Construction—All members are solid rolled steel sections, abundantly heavy to withstand any strain to which the sash might be subjected.

Head—The supporting member at the head is a special steel member that affords a perfect bearing for the sash, at the same time making a weathertight connection, thus doing away with flashing which is necessary when hinges are used to support the sash.

Jambs—A fixed panel is always used to make a weathertight connection to the building construction at the jambs. A storm panel underlaps the swing units and gives protection from driving storms at the ends when the sash is open.

Sill—A special rolled steel section of rigid construction that forms a close contact with structural sill member when the sash is in a closed position.

Joints—All sash is assembled by means of mortise and tenon joints accurately punched and fitted. The joints are both welded and riveted, making the strongest possible construction.

Sizes—Truscon continuous sash are made in standard sizes as shown in the table below. The units are designed for truss spans of 20 ft. on centers. The various units may be combined, however, to fit any desired opening.

CONTINUOUS STEEL SASH

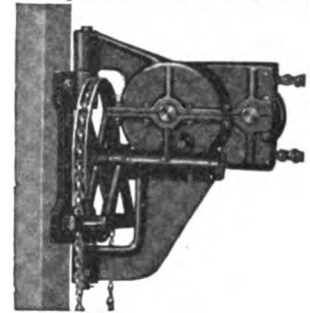
Height of sash	Height of opening	Glass Sizes		
		Standard panel	Fixed panel	Storm panel
3'	2'-10 1/2"	22 3/4" x 32 3/4"	22 3/4" x 32 3/4"	24" x 32 3/4"
4'	3'-10 1/2"	22 3/4" x 44 3/4"	22 3/4" x 44 3/4"	24" x 44 3/4"
5'	4'-10 1/2"	22 3/4" x 56 3/4"	22 3/4" x 56 3/4"	24" x 56 3/4"
6'	5'-10 1/2"	22 3/4" x 68 3/4"	22 3/4" x 68 3/4"	24" x 68 3/4"

SWEET'S CATALOGUE

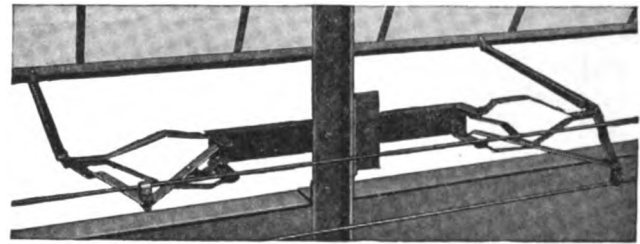
Truscon Mechanical Sash Operators

Truscon mechanical operating devices for steel sash are designed to meet all conditions. Although the operators are built in a large number of sizes they are divided into two general classes—tension operators and torsion operators.

Tension Type—Truscon tension operators are designed for use with Truscon continuous sash. The mechanism is so designed that the power increases faster than the load of the sash. The sash are locked in any open position desired, so there is no vibration or racking due to heavy winds. Every installation is an individual problem, and engineers and architects should consult our engineers before plans and layouts are made.

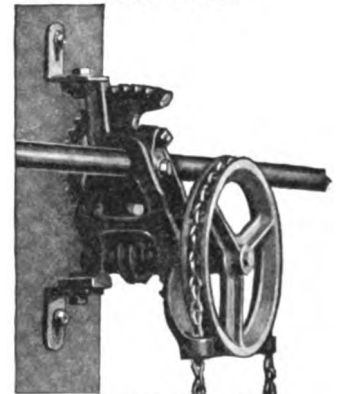


TENSION TYPE SASH OPERATOR



OPERATING ARM USED WITH TENSION POWER

Torsion Type—These operators are designed specially for controlling ventilators of the pivoted sidewall sash. The power consists of a simple worm and gear which exerts force through a torsion pipe and arms attached to the ventilators. This method of operation is extensively used for controlling ventilators in monitors, in powerhouses where a large number of ventilators occur in a single bay, and in sidewall layouts where a long run of ventilators are out of reach of the floor and it is desired to have them under unit control.



TORSION TYPE SASH OPERATOR

Counterbalanced Truscon Steel Windows

In Truscon sliding windows the lower sash is counterbalanced against the upper. The outside members are especially heavy sections of rolled steel welded at the corners, thus giving the sash exceptional rigidity and ease of operation.

Type G—Consisting of 2 sash to a window, one balanced against the other, giving a maximum ventilation of 50%.

Type H—Consisting of 3 sash, the center third of which is fixed while the upper and lower sash are balanced against each other, giving a maximum ventilation of 66 2/3%.



TYPE "G" WINDOW

Our steel sash monitors provide maximum efficiency at minimum cost.

Mechanical operators for monitors and sidewall sash.

Sash of similar type used in European countries for more than 100 years. Cheaper than wood sash and more durable. Less costly than masonry walls.

Mullions M-M save 25% in cost of installation.

Our low prices are made possible by 95% of the fabrication being machine work which makes for accuracy and good workmanship.

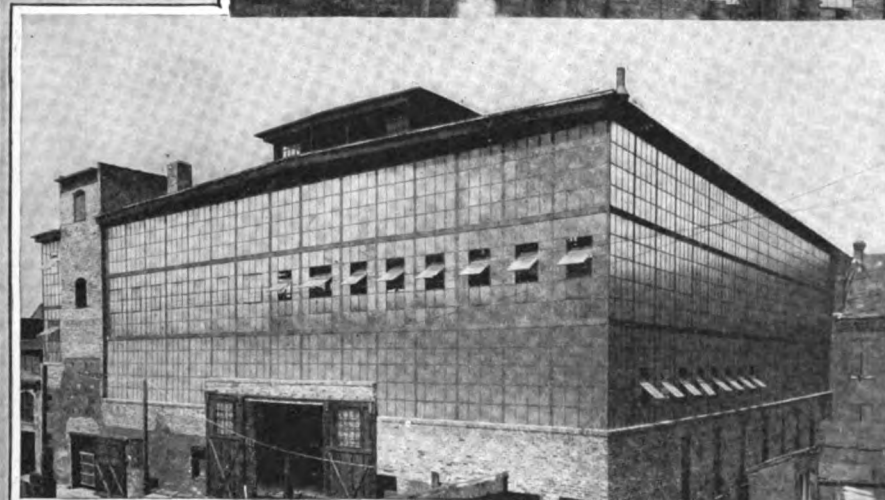
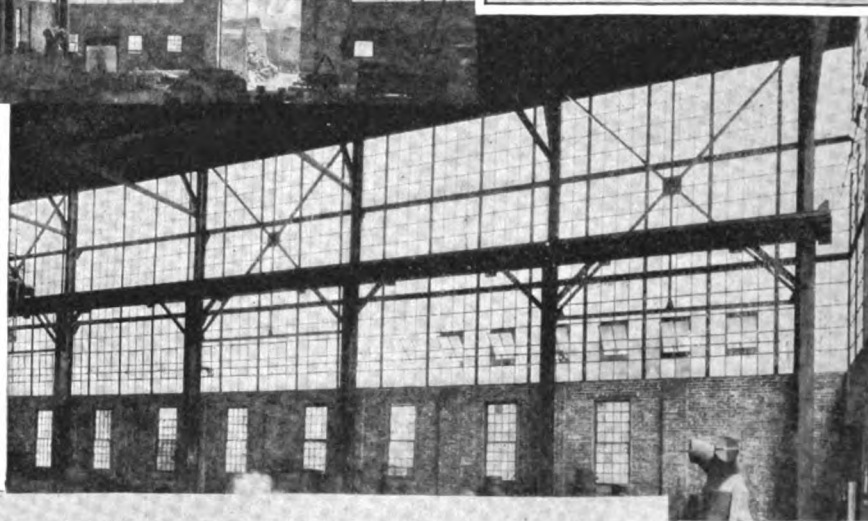
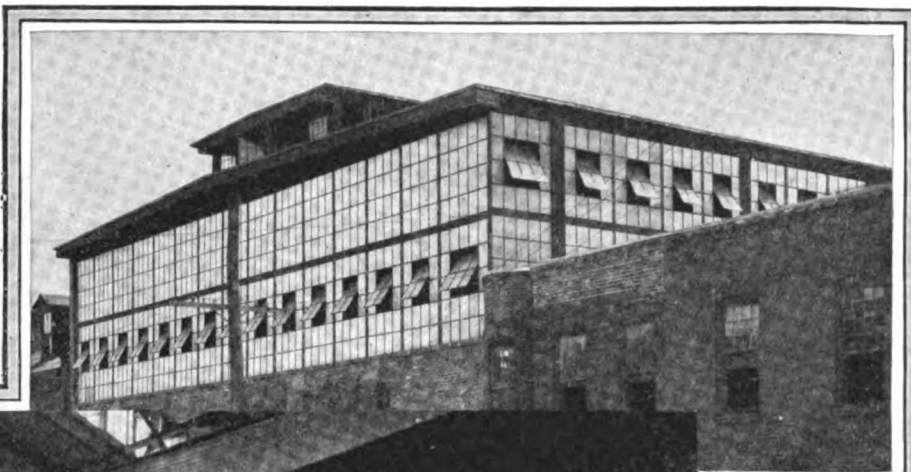
No masonry above bottom of sash. Increased light and ventilation at reduced cost.

Our engineering department is at your service for free consultation.

Send for catalogue showing our complete line.

Price list and discount sheet on application.

Note the 25-ft. high window walls, a new departure in continuous sash arrangement of stock sash.



A TEST OF STRENGTH AND PRACTICABILITY OF MESKER SASH WITH GRATIFYING RESULTS

A modern daylight industrial plant—12,000 sq. ft. of glass in The Geo. J. Fritz Foundry & Machine Co. Plant, St. Louis, Mo.

T. J. CALLAHAN CO.

Manufacturers of Sash Operating Apparatus

940 South Perry Street
DAYTON, OHIO

Products

SASH OPERATING APPARATUS, hand and electrically controlled, for steel or wood sash in factories, foundries, machine shops, central stations, power houses, theaters, churches, etc.

Also lighter installations for overhead windows, heavy transoms, etc., in store fronts and offices. Special types for greenhouses.

Types

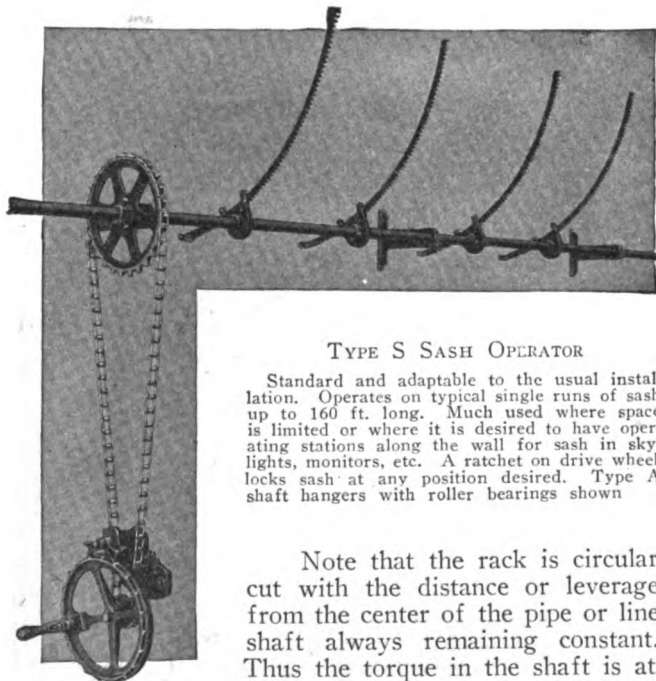
Type S is our standard direct chain drive with hand wheel control. It is simple, strong, flexible and remarkably light running.

Type G is worm and gear drive designed for electrical operating and for heavy duty hand control. This type is best adapted to runs of extreme length or sash of great weight.

Type O is direct-shaft drive for office or store use. It is light, neat appearing, and ample for smaller installations. May be finished to match the hardware.

Rack and Pinion Apparatus

All Callahan sash operators are of the rack and pinion type and of patented design that embraces some very essential points of superiority.



TYPE S SASH OPERATOR

Standard and adaptable to the usual installation. Operates on typical single runs of sash up to 160 ft. long. Much used where space is limited or where it is desired to have operating stations along the wall for sash in skylights, monitors, etc. A ratchet on drive wheel locks sash at any position desired. Type A shaft hangers with roller bearings shown

Note that the rack is circular cut with the distance or leverage from the center of the pipe or line shaft always remaining constant. Thus the torque in the shaft is at all times a minimum regardless of

length of rack. This gives Callahan sash operators a decided advantage in opening long lines of top hung or heavy center pivoted sash. And this, in turn, reduces the number of operating stations required to a minimum and enables them to be placed at the most convenient points.

This direct-action principle produces a direct thrust which eliminates any tendency to wrench or twist the

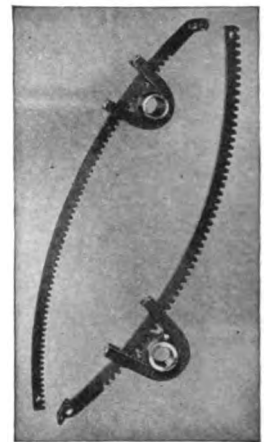


sash. The free rotary movement of the rack does away with the harmful strains and makes easier operation. It produces also an absolutely tight close down. Convenience, neatness, safety, economy, and ease of operation all rank high in Callahan installations.

Construction

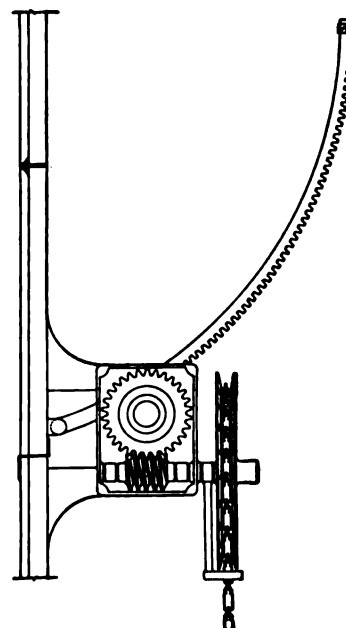
The construction is simple, neat in appearance and exceptionally strong. Fittings of mild steel are used in place of castings wherever possible or desirable, but where castings are used, they are of the very highest grade. The shaft hangers are made in several styles, including roller bearings with broad feet and adjustable main arms so as to easily permit perfect alignment of the line shaft regardless of possible unevenness in the walls.

A Callahan feature very desirable in many installations where space is limited is that the



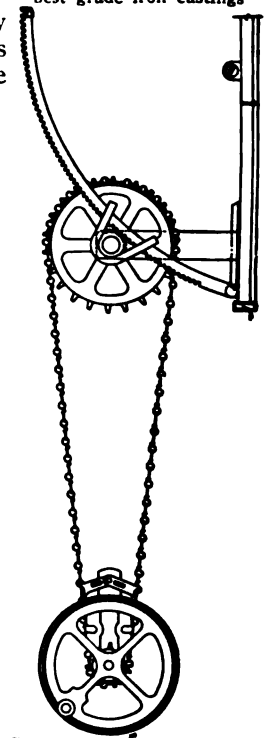
THE CALLAHAN SEGMENTAL ARM OR RACK

Made convex and concave. Concave arm may be attached to top of sash and arm will follow around with the arm projecting no farther than the sash, thus conserving space—an important advantage where there is crane or other interference. Arms made of different thicknesses of material to accommodate different weights of sash. Rack is supported against pinion by steel rollers revolving on steel spacer rivets, thereby greatly reducing friction. Housings, mild steel; pinion gears, best grade iron castings



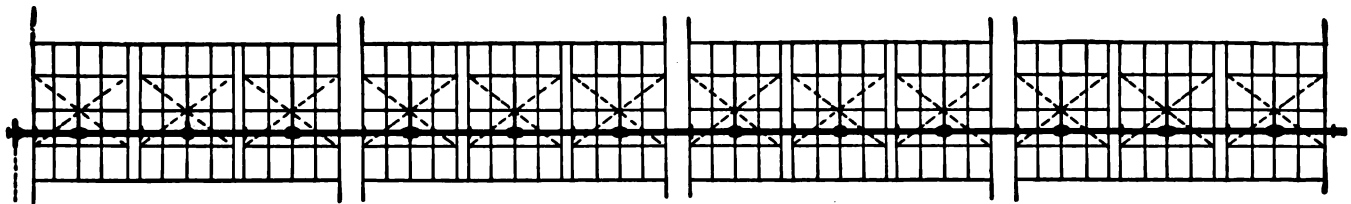
SECTIONAL VIEW OF TYPE G WORM AND GEAR DRIVE

A powerful apparatus for sash of unusual weight. Power transmitted through worm gear driven by endless chain, hand operated or electric motor controlled from switch panel placed where most convenient



SECTIONAL VIEW OF TYPE S CHAIN DRIVE

Typical of the requirements of almost any sash operating problem. Ratchet on drive wheel locks sash in any position. Limit stops provided for open and closed position of sash



TYPICAL SINGLE RUN CONTROLLED WITH A TYPE S OPERATOR

Handles 160 ft. of sash with operator installed at one end or in the middle of the run; double the length usually handled by one operating station. Supplied with vertical shaft and bevel gear drive if desired

circular cut arms or racks may be placed so that they do not project out beyond the shaft at any time during movement of sash.

All Callahan operators are self-locking at any point. They have a large factor of safety and are exceptionally easy running.

Engineering Service

The range of types offered in Callahan sash operators is such as to fulfill the requirements of practically all installations. Our Engineering Department is at your service to lay out proper installations and suggest modifications or special designs.

Complete instructions for erecting are furnished and installations can easily be made by any mechanic. However, in the case of large or unusually difficult

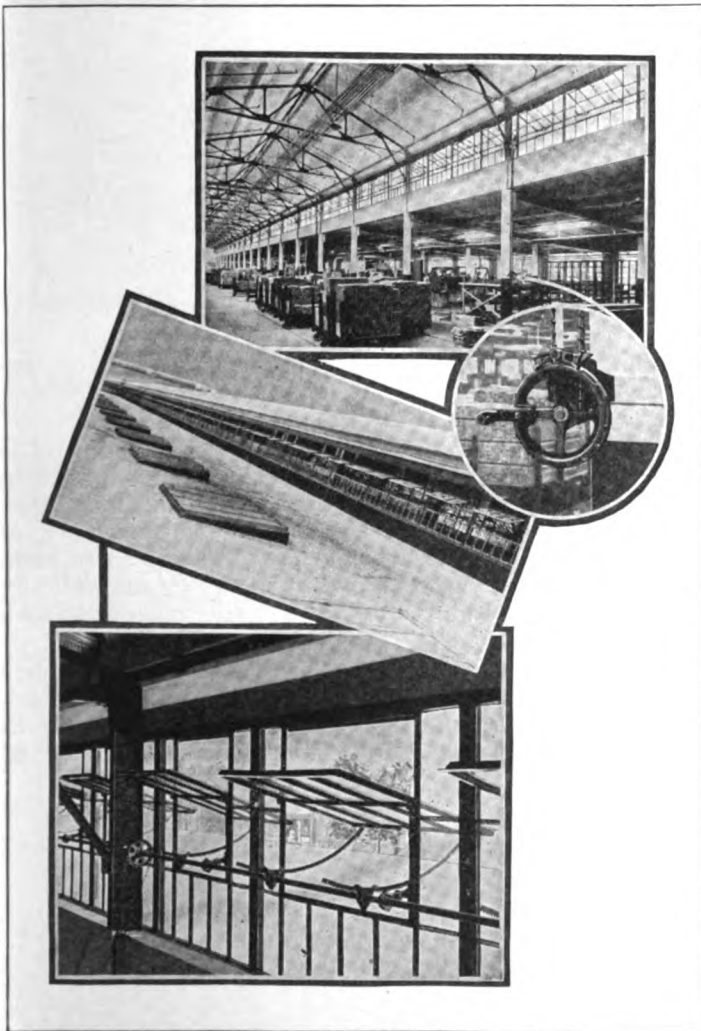
installations, if it is desired, we are prepared to furnish a superintendent.

Catalogues

We publish two catalogues—one descriptive of apparatus for industrial plants and one of greenhouse ventilating equipment.

Installation

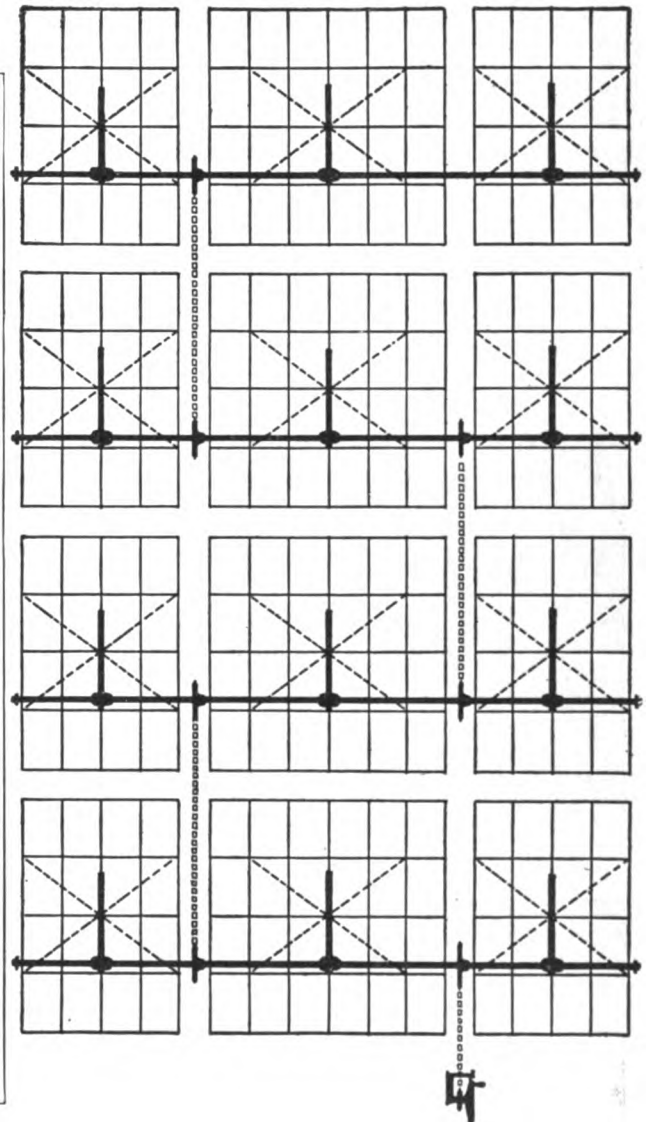
Callahan sash operators are in use in many of the largest and finest factory buildings in this country—more than two miles of Callahan operators are in the National Cash Register buildings in Dayton.



CALLAHAN INSTALLATION IN PLANT OF GLOBE-WERNICKE CO., CINCINNATI, OHIO

Sash in six bays are operated with Type S drive from one station. Insert shows a close-up of an operating station. Note how evenly ventilators are raised, as shown by exterior view

SWEET'S CATALOGUE



ONE CALLAHAN OPERATOR CONTROLS TYPICAL POWER HOUSE BAY

All sash are controlled by Type S direct chain drive from one operating station. Operator may be placed on the mullions or at either end and may be a vertical shaft with bevel gears or worm and gears. Heretofore two operating stations were required to handle a series of this kind

KING CONSTRUCTION COMPANY

Sash Operating Devices

GENERAL OFFICE AND FACTORY
NORTH TONAWANDA, N. Y.

SALES OFFICES

NEW YORK, N. Y., 1 West 47th Street
BOSTON, MASS., Board of Trade Building

PHILADELPHIA, PA., Harrison Building
SCRANTON, PA., 307 North Irving Street

Product

SASH OPERATORS for operating hinged and pivoted wood or metal sash.

Uses

For the operation of continuous or multiple sash in factory buildings, machinshops, foundries, etc.

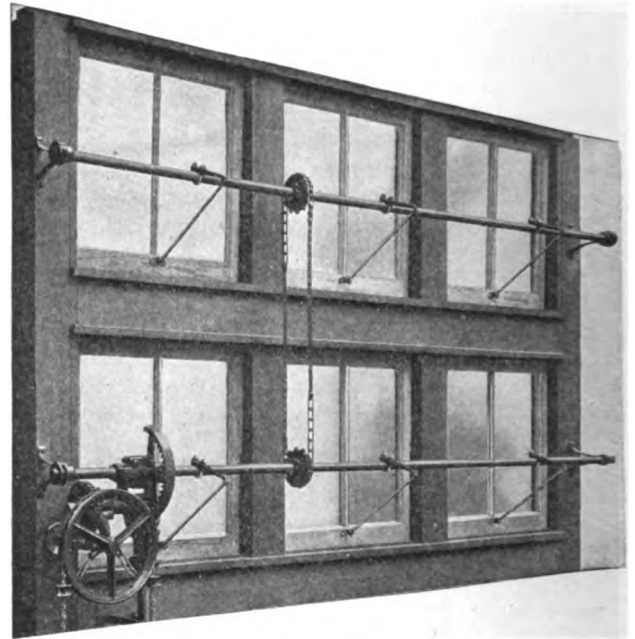
Description

Shaft rotation is the simplest and most satisfactory method of operation. Uses the smallest number of friction bearing points and is less liable to need repairs. When repairs or replacements are necessary the work can be very easily done without the employment of an expert. This is the principle on which all styles of King operators work.

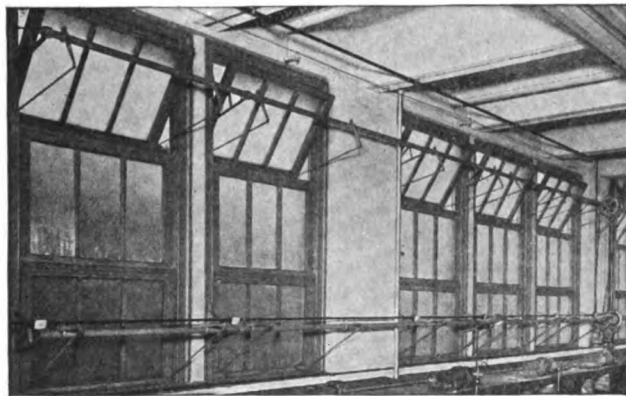
Operation

The shaft is revolved by a worm and gear, operated either by a hand wheel or chain and wheel. To the shaft is attached a malleable arm which in turn operates a lever rod that is fastened to the sash.

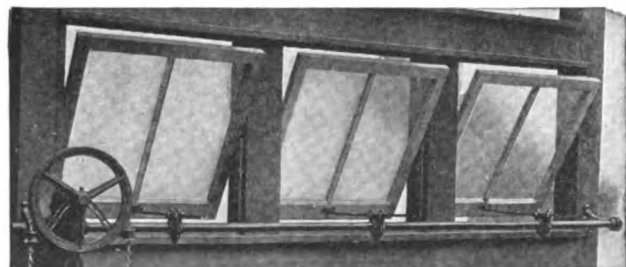
Where runs are so long that the plain arm and lever gives too much torsion to shaft, a rack and pinion is used, thus greatly reducing leverage and consequently



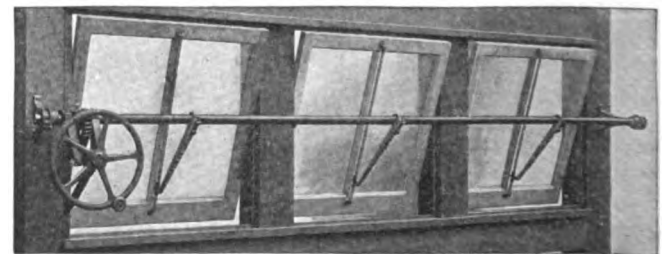
DOUBLE GEAR MACHINE OPERATING TWO LINES OF SASH



ARM AND LEVER OPERATORS ON MULTIPLE TIERS



RACK AND PINION DEVICE FOR LONG RUNS



CLOSE WORKING APPARATUS FOR USE IN LIMITED SPACE

the torsion. Roller bearing hangers can also be furnished when necessary to take care of special conditions.

The King patented brass spring connecting rod is furnished when required. This brass spring placed in this connection between the sash and operating lever allows the sash to remain open should snow, ice or other obstruction accumulate under one or more sash. When the obstruction disappears the spring automatically closes the sash, preventing the uneven strain on the sash or shaft.

Several different types or sizes of worms and gears suitable for all different requirements can be furnished. Recommendation for the proper operators to be used will be made on receipt of particulars and results wished to be obtained.

LORD & BURNHAM CO.

Manufacturers of Sash Operating Apparatus for Hinged and Pivoted Sash
IRVINGTON-ON-HUDSON, N. Y.

Products

SASH OPERATING APPARATUS in various styles and sizes for Operating Hinged and Pivoted Sash in factories, foundries, car barns, roundhouses, powerhouses, machinshops, steamers, banks, churches, prisons, greenhouses, also for Heavy Transoms in such places as store fronts, hotels, public buildings, etc.

Rocker Shaft Apparatus

Our standard apparatus (Fig. 1) consists of a worm and gear to turn a rocker shaft, to which are attached arms that in turn act directly on the sash through suitable rods. Arms are secured to shaft by combined bolting and setscrew cap, or by setscrew only if desired.

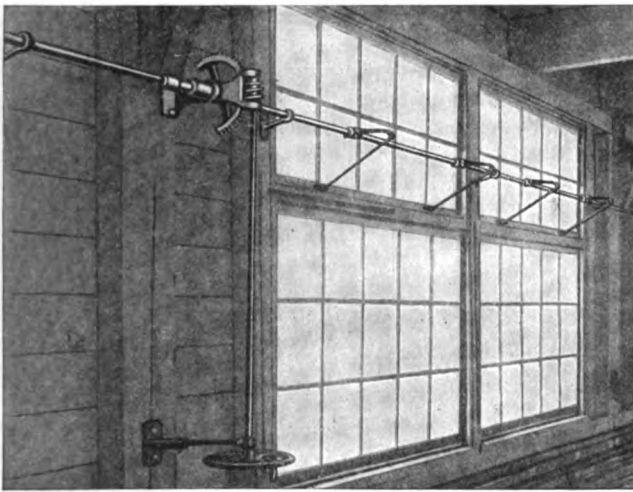


FIG. 1. ROCKER SHAFT APPARATUS

Rack and Pinion Apparatus

This type of apparatus (Fig. 2) is intended primarily for long runs of heavy hinged sash. On account of the small pitch radius of the pinion ($1\frac{1}{2}$ in.) the leverage on the shaft is so much reduced that the torsion in the shaft is reduced to a minimum.

The simplicity of this apparatus is a strong point in its favor. The direct horizontal thrust given to the sash prevents all harmful strains.

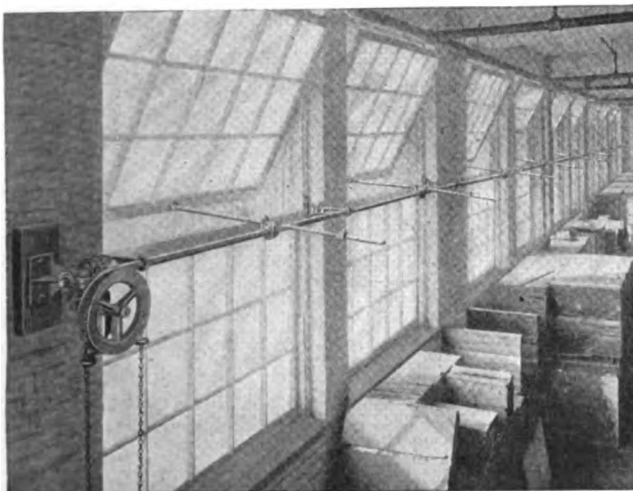


FIG. 2. RACK AND PINION APPARATUS

Screw Thread Transom Operators

Transom operators (Fig. 3) made in 2 sizes: No. 1 for heavy and No. 2 for extra heavy transoms. This apparatus consists of two enclosed miter gears, one of which is threaded and engages with a vertical rod linked to a rocker shaft at bottom of transom, thus allowing it to be supported by an arm and rod at either end, relieving it of all injurious strains, and holding it rigidly in position against wind pressure.

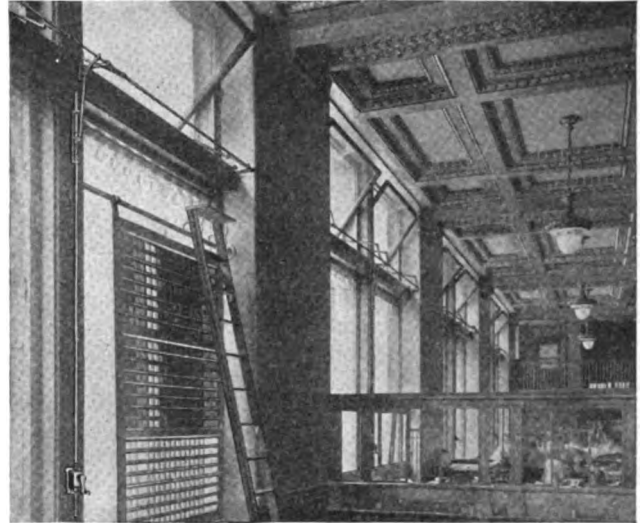


FIG. 3. SCREW THREAD TRANSOM OPERATORS

Tension Lever Apparatus

Fig. 4 for runs too long or too heavy for practical operation with either our rocker shaft or rack and pinion type. Special circular on request.

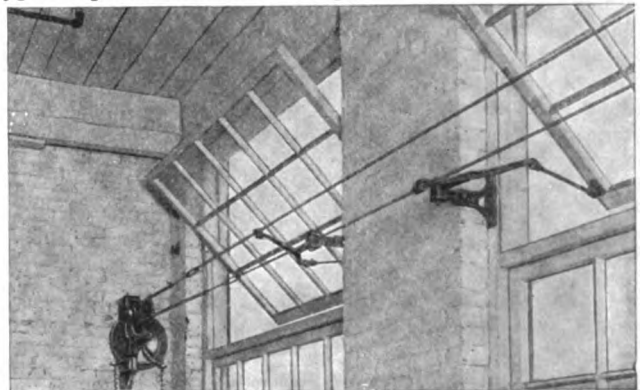


FIG. 4. TENSION LEVER APPARATUS

Erection

Full directions for erecting are sent with apparatus, so that it can be easily installed by any mechanic.

Estimates and Co-operative Service

On receipt of data giving description of sash and that part of the building where it is intended to install the apparatus, we will gladly submit sketches, suggestions, and estimates for furnishing our stock apparatus, or one specially designed to meet unusual conditions; also, estimates for erecting the apparatus when desired.

Catalogue

Catalogue giving full and detailed description of each apparatus sent on request.

THE PAYSON MANUFACTURING COMPANY

Manufacturers of Sash Operating Devices and Builders' Hardware

2920 Jackson Boulevard

CHICAGO, ILL.

Products

SASH OPERATING DEVICES as follows:

Superior Operator, hand wheel control, for pivoted sash.

Ideal Operator, chain control, for pivoted sash.

Reliance Operator, chain or hand wheel control, for top or bottom hinged, or heavy pivoted sash.

Triumph Operator, hand wheel control, for pivoted sash, monitor type.

Peerless Operator, chain control, for top hinged continuous steel sash.

Duplex Operator, for heavy transoms; Victor Operator, chain wheel control, for vertically pivoted sash; Monarch Operator, for single vertically pivoted sash.

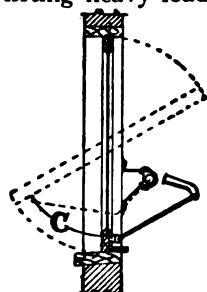
Also manufacturers of Simplex Transom Lifter, for all types of transoms; Payson No. 1 Casement Adjuster, for all types of casement sash; Payson Signal Sash Lock, for double hung windows; Payson No. 50 Concealed Transom Lifter, for transoms where concealed device is required.

Specifications

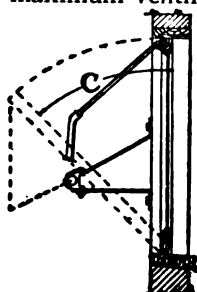
This list of Payson products is selected with the hope that it may be used freely by architects in writing specifications. The list contains standard articles that are guaranteed to give perfect satisfaction.

Torsion Operators

Detail drawings and cuts are shown of four of the most generally used of the many types of operators we manufacture. So far as general design is involved, one of these four is almost certain to fulfil the requirements of any sash operating problem. The Ideal is used where chain control is required; and chain control is recommended because of its simplicity and ease of erection. The Superior, where a hand wheel must be used. The Triumph, for all monitor work where a hand chain hanging straight down can not be used. The Reliance, for lifting heavy loads and giving maximum ventilation.



Horizontally Pivoted Sash



Bottom Hinged Sash

DUTY DETAILS OF TORSION SASH OPERATORS

X ft. in.	Standard			Extra Heavy			X ft. in.	Standard			Extra Heavy		
	A	B	C	A	B	C		A	B	C	A	B	C
2 0	130	75	60	150	85	60	2 0	60	40	50	90	55	50
2 6	120	75	60	150	85	60	2 6	54	40	45	81	50	45
3 0	110	60	45	150	85	60	3 0	48	30	30	72	48	30
3 6	100	60	45	140	75	45	3 6	40	25	30	66	36	30
4 0	90	50	45	130	70	45	4 0	30	20	30	50	30	30
4 6	80	45	45	120	65	45	4 6	24	15	25	40	25	25
5 0	70	40	45	100	55	45	5 0	16	10	25	28	16	25
5 6	60	40	30	90	50	30	5 6	12	6	20	21	12	20

X—Height of sash. A—Maximum length of run. B—Maximum distance from power to end of run. C—Standard opening in degrees.

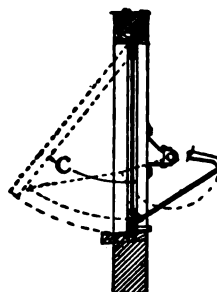
Tension Operators

Tension devices, Peerless "A" and "B," are fully described in our catalogue, which we would like to send if one is desired. We have worked for a number of years on tension devices to operate long runs of sash, and have finally accomplished two things: that most dangerous of all makeshifts, the counterweight, has been eliminated; we have invented and perfected the only tension device where the leverage power increases as the load increases. If engineers want these improvements embodied in tension devices, specify the "Peerless" manufactured by THE PAYSON MANUFACTURING COMPANY.

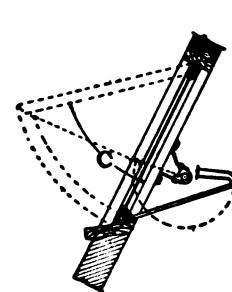
Service

Payson sash operating devices are *made to order*, using measurements taken from the plans and checked at the building. Every job is exhaustively studied by Payson engineers, and a drawing showing the scheme thought most satisfactory is prepared and submitted to you for approval as to layout and general design. After this approval is obtained, if there is any question as to measurements, drawings are forwarded to the building to be checked. Time is really saved in this way, because the operators can then be erected from the blue print with the certainty that every part will fit the place for which it is intended.

The engineer and architect should make liberal use of Payson service, as many times minor construction details make it necessary to change entire layouts, even to altering type of operator. For example, an interference by sway bracing may require change from the Peerless operator to the Reliance or Peerless "B." This should be determined, if possible, before specifications and plans have been sent out for estimates. By consulting with us you can be certain that the type of device named in the specification will fulfil all requirements, and often slight changes in construction are suggested which result in lowering cost.



Top Hinged Sash Hung Vertical

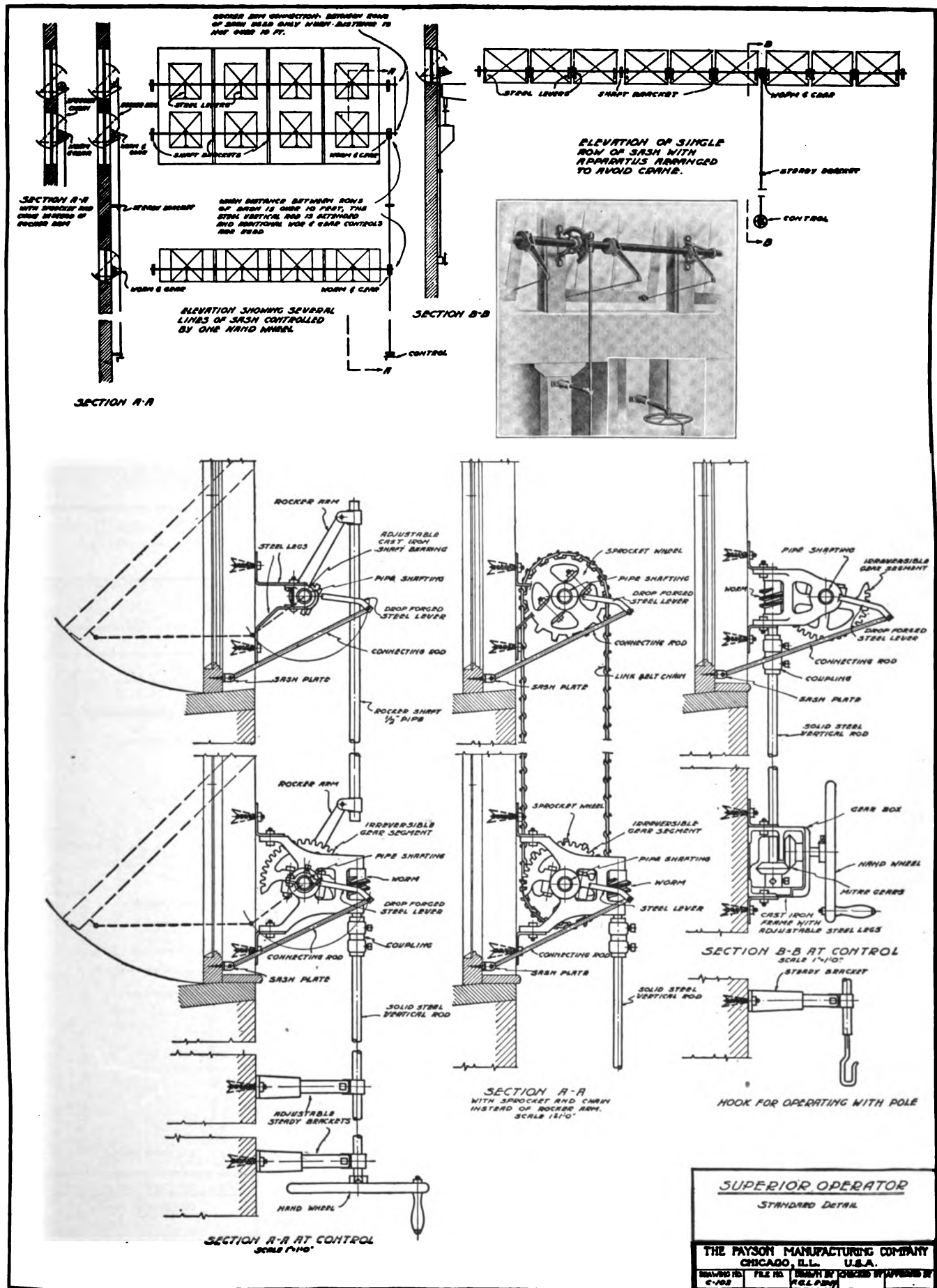


Top Hinged Sash at an Angle

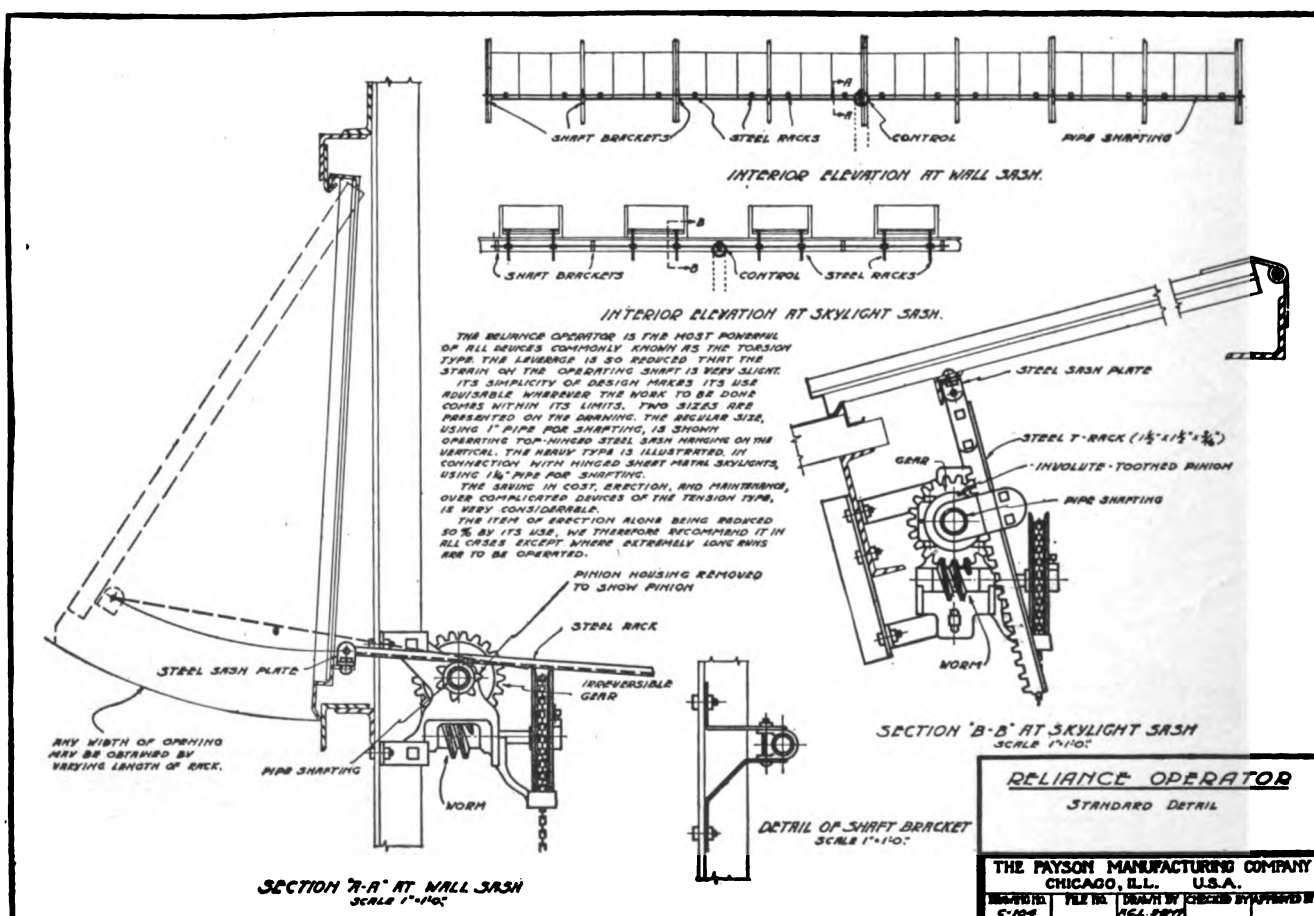
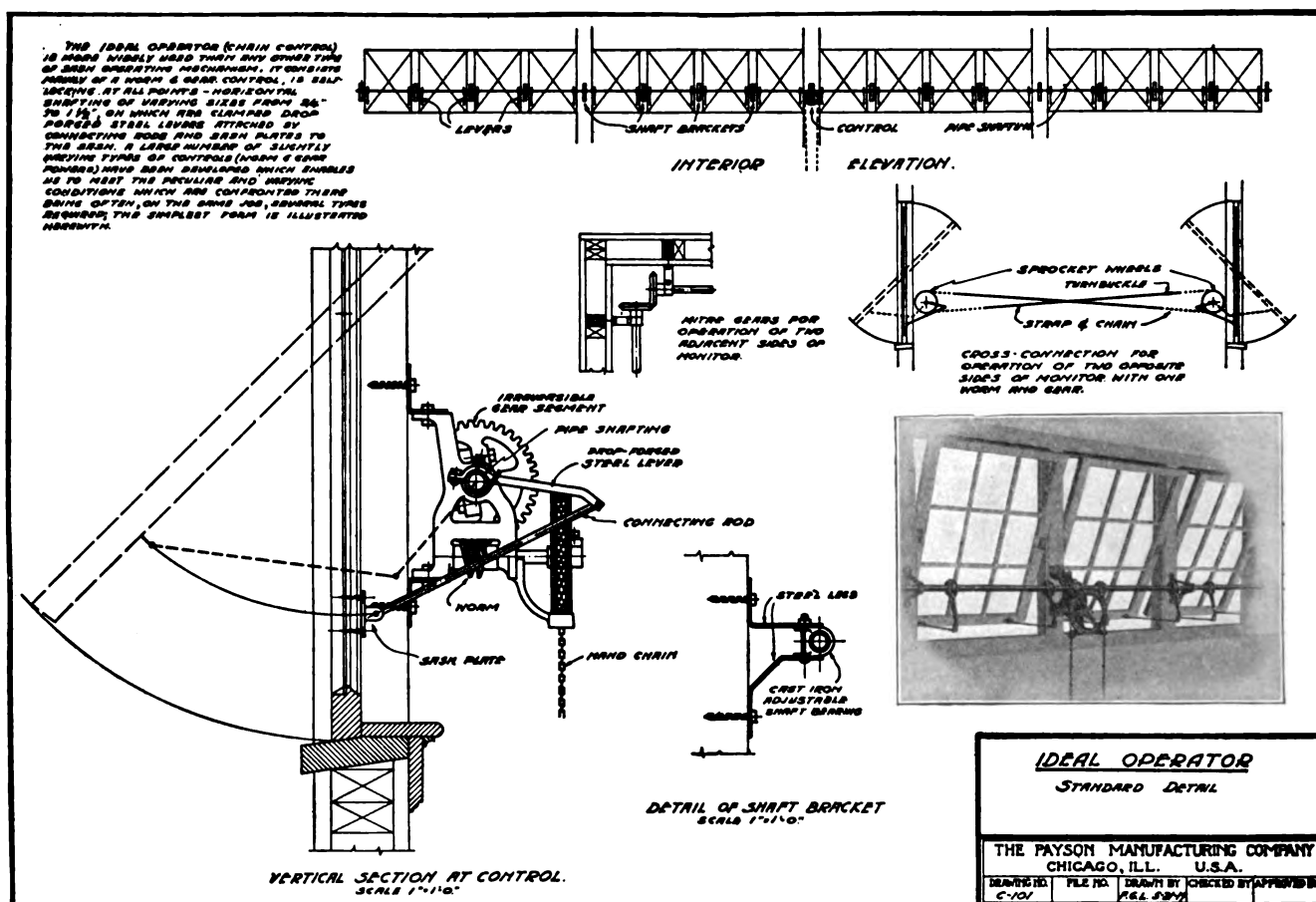
DUTY DETAILS OF TORSION SASH OPERATORS

X ft. in.	Standard			Extra Heavy			X ft. in.	Standard			Extra Heavy		
	A	B	C	A	B	C		A	B	C	A	B	C
2 0	70	40	60	100	60	60	2 0	40	20	60	60	40	60
2 6	60	40	45	90	55	45	2 6	34	20	45	50	40	45
3 0	50	30	45	80	50	45	3 0	30	20	45	44	30	45
3 6	40	25	45	70	45	45	3 6	26	15	45	40	30	45
4 0	36	20	30	60	40	30	4 0	22	15	30	36	25	30
4 6	30	15	25	50	35	25	4 6	18	15	20	30	20	20
5 0	24	15	20	40	25	20	5 0	14	10	20	24	16	20
5 6	20	10	20	30	20	20	5 6	10	10	20	20	10	20

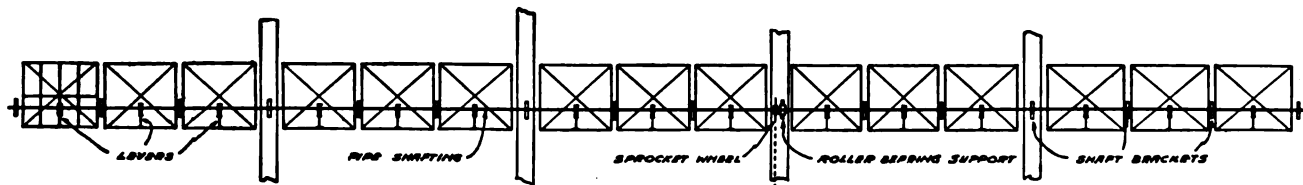
X—Height of sash. A—Maximum length of run. B—Maximum distance from power to end of run. C—Standard opening in degrees.



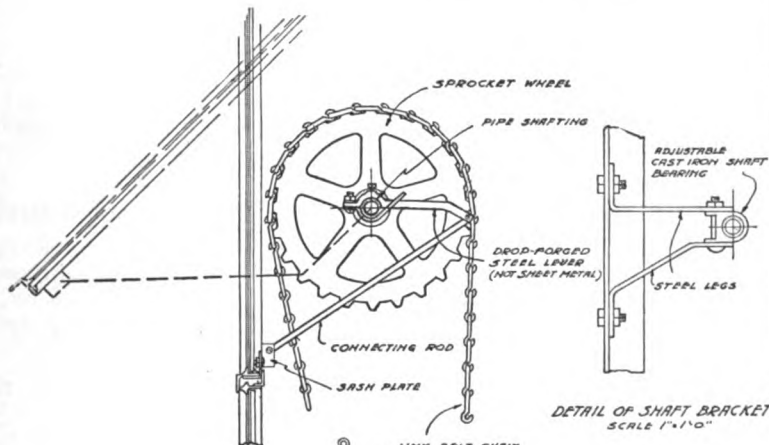
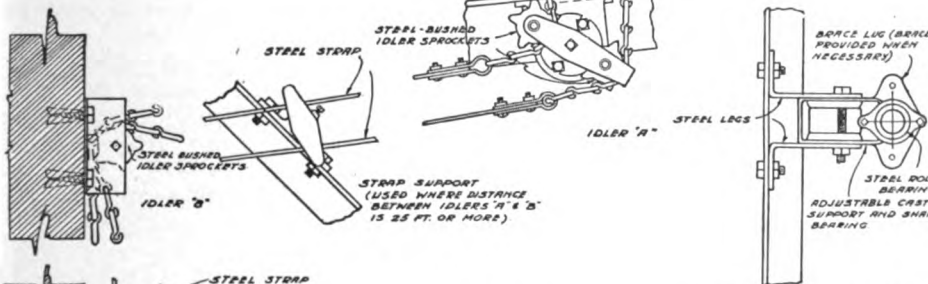
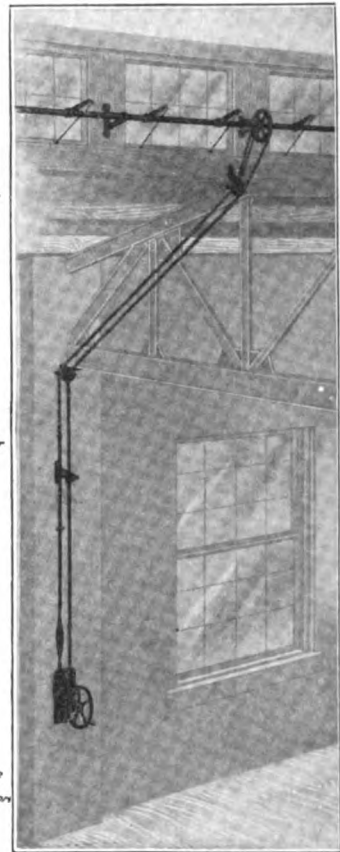
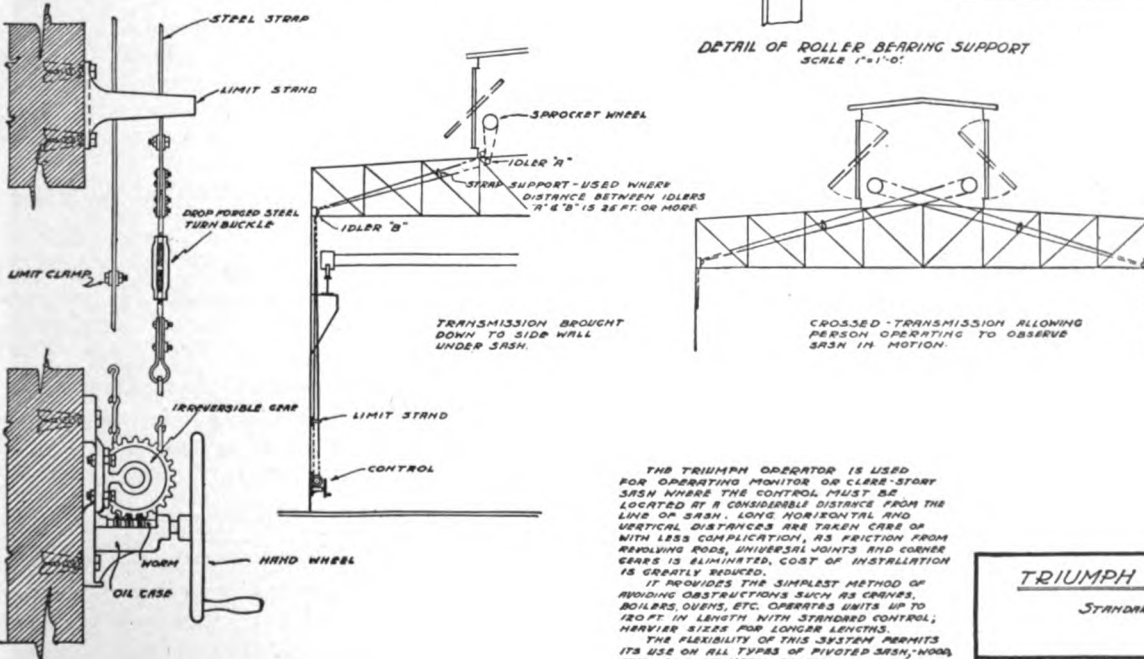
STANDARD DETAILS OF SUPERIOR SASH OPERATOR



STANDARD DETAILS OF IDEAL AND RELIANCE SASH OPERATORS



INTERIOR ELEVATION AT SASH

DETAIL OF SASH BRACKET
SCALE 1"=1'-0"DETAIL OF ROLLER BEARING SUPPORT
SCALE 1"=1'-0"VERTICAL SECTION AT CONTROL
SCALE 1"=1'-0"

THE TRIUMPH OPERATOR IS USED FOR OPERATING MONITOR OR CLERK-STORY SASH WHERE THE CONTROL MUST BE LOCATED AT A CONSIDERABLE DISTANCE FROM THE LINE OF SASH. LONG HORIZONTAL AND VERTICAL DISTANCES ARE TAKEN CARE OF WITH LESS COMPLICATION, AS FRICTION FROM REVOLVING RODS, UNIVERSAL JOINTS AND CORNER GEARS IS ELIMINATED. COST OF INSTALLATION IS GREATLY REDUCED.

IT PROVIDES THE SIMPLEST METHOD OF AVOIDING OBSTRUCTIONS SUCH AS CRANES, BOILERS, OVENS, ETC. OPERATES UNITS UP TO 100 FT. IN LENGTH WITH STANDARD CONTROL; HEAVIER SIZES FOR LONGER LENGTHS.

THE FLEXIBILITY OF THIS SYSTEM PERMITS ITS USE ON ALL TYPES OF PIVOTED SASH; WOOD, STEEL, OR SHEET METAL, REGARDLESS OF THEIR LOCATION AND ACCESSIBILITY. ON SASH FOUR FEET WIDE OR OVER, TWO LEVERS ARE USED - WITH SASH PLATES LOCATED ON JAMB ENDS OF SASH.

TRIUMPH OPERATOR

STANDARD DETAIL

THE PAYSON MANUFACTURING COMPANY
CHICAGO, ILL. U.S.A.

DESIGNED BY C-703 FILE NO. DRAWN BY CHECKED BY APPROVED BY

THE G. DROUVÉ COMPANY

Manufacturers of Puttyless Skylights and Sash Operators

TELEPHONE
NOBLE 1950

(Post Office Address)

FACTORY
FAIRFIELD

CABLE
Western Union Code

BRIDGEPORT, CONN.

AGENCIES IN ALL PRINCIPAL CITIES

Products

"ANTI-PLUVIUS" PUTTYLESS SKYLIGHT, trade-marked and patented.

"ANTI-PLUVIUS" (NON-CORROSIVE) PUTTYLESS SKYLIGHT, trade-marked and patented.

"STRAIGHT-PUSH" SASH OPERATOR, tension type.

"DROUVÉ LOVELL" SASH OPERATOR, tension type.

WORM and GEAR SASH OPERATOR, torsion type.

Also manufacturers of the "Drouvé" Double Gutter Ventilators.

Facilities and Service

A modern one-story factory building containing 40,000 sq. ft. of floor space, equipped complete with the most modern sheet metal and skylight working machinery known to the trade.

This entire plant, one of the largest of its kind in the country, is devoted exclusively to the manufacture of our "Anti-Pluvius" puttyless skylights, ventilators and various types of sash operating devices.

A competent Engineering Department, invested with our twenty years of experience in the manufacture of puttyless skylights, is maintained for the purpose of furnishing you with practical information pertaining to all types of skylight construction.

Detailed drawings of different types of skylights embodying various conditions of installation will be forwarded on request, if you will advise us approximately regarding requirements.

We maintain an erecting force thoroughly skilled in the erection of our skylights.

Catalogues and estimates will be furnished on request.

"Anti-Pluvius" Puttyless Skylights

The original "Anti-Pluvius" puttyless skylight construction was first placed on the market by us twenty years ago. It was necessarily based on theory. The "Anti-Pluvius" puttyless skylight of today is the result of twenty years of practical experience obtained under the most exacting conditions. It is interesting to note in this connection that the basic principle of our construction is the same today as in the original design. Experience has proved that only a few minor changes have been necessary to make a perfect skylight.

"Anti-Pluvius" (Non-corrosive) Puttyless Skylights

This skylight in design and construction is identical with our "Anti-Pluvius," the difference is in the metals used. These are of non-corrosive materials (not a protective process). This construction is guaranteed absolutely against any form of deterioration for an indefinite length of time. The cost of this construction is surprisingly low considering the fact that it is a skylight entirely free from any maintenance expense. This con-

struction is ideal for use on powerhouses, chemical plants, railroad shops, foundries, etc., as it is the only construction that will stand up under the conditions existing in these types of buildings.

Advantages of "Anti-Pluvius" Puttyless Skylights

The "Anti-Pluvius" puttyless skylight (either type) will satisfy the most exacting requirements for strength.

It is positively watertight. The strength of materials of the structure is ideal (see specifications opposite page).

The glass in the skylight may be readily cleaned by laying planks across the bridge sections, on which men can stand without injury to the glass, bridges, or any other parts of the skylight structure.

The frames are flexible and ample allowances are made for expansion and contraction, vibration and wind pressures.

The skylight is adaptable to all types of roof construction.

They can be erected by anybody, anywhere.

Each light of glass as placed in the skylight is independent of every other light. The lights do not come in contact with each other nor do they come in contact with any metal.

The glass rests on pure non-rotting cattle hair felt.

"Straight-Push" Sash Operator

Designed to operate all types and makes of sash in monitors, skylights and sidewalls of buildings. Designed to withstand all manhandling and unexpected conditions.

Guide rolls mounted on brass pins to prevent rusting. All working parts have brass-to-iron connections. The sweep of levers is level.

Leverage force applied is uniform throughout length of line, insuring equal opening and closing of all sash.

Erecting crews are maintained by the company to handle any job, anywhere, or any workman can install from erection instructions.

"Improved Lovell Dreadnought" Sash Operator

This design, with its sweeping movement, gives large openings to heavy top hung sash. All parts made extra heavy, with phosphor bronze working joints.

Worm and Gear Operators

Practically all types of standard worm and gear devices supplied as desired for operating lines of ventilating sash in sidewalls, pitched roofs, sawtooth roofs and monitors, and for pivoted or hinged sash.

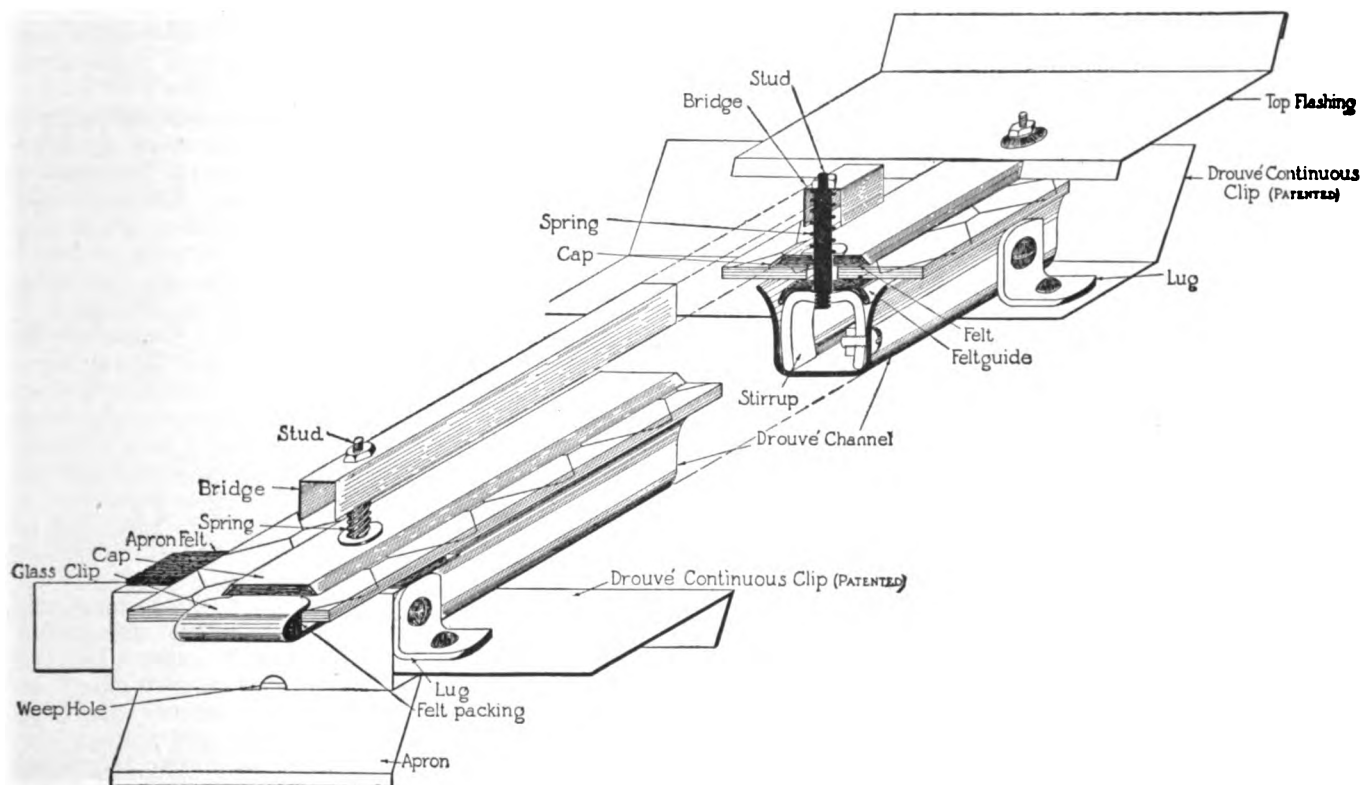
Details of standard worm and gear operating devices forwarded on application and, when sufficient information is given, recommendations will be made as to efficient and economical procedure.

Specification of Materials used in "Anti-Pluvius" Puttyless Skylights

Channel.....	High carbon steel (painted or galvanized)
Stirrup.....	High carbon steel
Felt guide.....	No. 18 gage galvanized iron
Stud.....	Tobin bronze $\frac{3}{8}$ in. diameter
Glass clip.....	.050 hard brass
Cap.....	No. 24 gage galvanized iron or 16 oz. copper
Spring.....	Phosphor bronze
Bridge.....	No. 18 gage galvanized iron or 30 oz. copper
Top flashing.....	No. 24 gage galvanized iron or 16 oz. copper
Curb apron.....	No. 24 gage galvanized iron or 16 oz. copper
Lugs.....	$\frac{1}{8}$ x 1 in. steel
Continuous clip.....	No. 18 gage galvanized iron

Specification of Materials used in "Anti-Pluvius" (Non-corrosive) Puttyless Skylights

Channel .....	.107 brass
Stirrup .....	.186 brass
Felt guide .....	.050 brass
Stud	Tobin bronze
Glass clip .....	.050 hard brass
Cap	16 oz. copper
Spring	Phosphor bronze
Bridge	30 oz. copper
Top flashing	16 oz. copper
Curb apron	16 oz. copper
Lugs .....	.125 brass
Continuous clip .....	.050 brass



CONSTRUCTION DETAIL OF "ANTI-PLUVIUS" SKYLIGHT

Specifications for "Anti-Pluvius" Puttyless Skylights

Skylights shall be of the "Anti-Pluvius" puttyless construction as manufactured by THE G. DROUVÉ COMPANY, Bridgeport, Conn., having U-shaped high carbon steel channel supporting frame, painted [galvanized]. All metal parts which are exposed to the weather to be of galvanized iron [copper]. Provision for expansion and contraction shall be obtained through the use of phosphor bronze springs.

Glass shall be laid on pure non-rotting cattle hair felt.

Skylights shall be equipped with walk bridges, so constructed as to sustain the weight of several persons, without pressure on the glass.

Glass [as desired].

Skylight contractor's bid to include all work above the skylight curbs.

Specifications for "Anti-Pluvius" (Non-corrosive) Puttyless Skylights

Skylights shall be of the "Anti-Pluvius" (Non-corrosive) puttyless construction as manufactured by THE G. DROUVÉ COMPANY, Bridgeport, Conn., having all metal parts exposed to the interior of building of brass and all metal parts exposed to the weather of copper, as per specification sheet in SWEET'S CATALOGUE. Provision for expansion and contraction shall be obtained through the use of phosphor bronze springs.

Glass shall be laid on pure non-rotting cattle hair felt.

Skylights shall be equipped with walk bridges, so constructed as to sustain the weight of several persons, without pressure on the glass.

Glass [as desired].

Skylight contractor's bid to include all work above the skylight curbs.

THE E. F. HAUSERMAN COMPANY

Glasteel Puttyless Skylights

1729 East 22nd Street
CLEVELAND, OHIO

BRANCH OFFICES

NEW YORK, N. Y., 41 East 42nd Street

PITTSBURGH, PA., Oliver Building

DETROIT, MICH., Penobscot Building

Products

HAUSERMAN-SYSTEM SKYLIGHTS (Glasteel Puttyless Construction).

Designers, manufacturers and erectors of complete Skylight Installations.

For Hauserman-System Toilet Partitions, see page 271; for Hauserman-System Industrial Partitions, see pages 908-911; for Hauserman-System Shelving, see pages 916-917.

Service

Hauserman-System skylights are *designed* and *built* from the user's viewpoint, based on a seven years' experience with all types of skylights under actual service conditions, and *installed* as an integral part of the roof. The Hauserman-System, "Organized for Service," extends from a thorough study of requirements to the final installation of the job.

Hauserman-System Skylights

Hauserman-System skylights are designed particularly for the discriminating engineer or architect who desires a quality product with a minimum maintenance cost. Every Hauserman-System skylight is designed and built to comply with the following exact requirements of the ideal skylight:

(1) **As an Integral Part of the Roof**—It will last as long as the roof. All parts exposed to weather are made of non-corrosive, rustproof metals; minimum area of exposed parts; all moisture-collecting "pockets" eliminated; free circulation of air to all parts results in rapid evaporation; brass dome nuts and washers, sherardized bolts and

phosphor bronze springs hold glass in place; cushions of non-rotting hair felt; support bars covered with two coats of baked-on enamel.

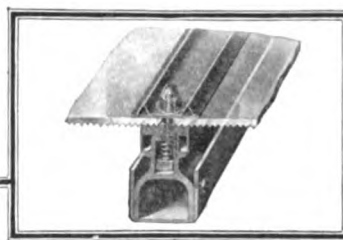
(2) **To keep moisture out of the Building**—Rigid top cap to hold felt packing tight against glass; reamed dome nuts fit over extrusion around bolt holes to form watertight fit at this very pregnable point; asphaltic sealing of overlapping glass; large condensation gutters in which free circulation of air hastens evaporation.

(3) **To Admit a Maximum of Light**—Width of all members restricted to give substantial bearing surface and yet offer minimum obstruction to light; wire Pentecor glass used throughout transmits maximum illumination.

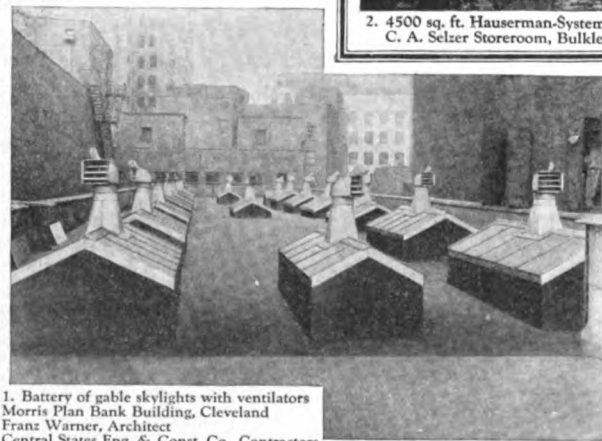
(4) **To Prevent Breakage of Glass**—Rigid, sturdy one-plane frame to keep glass level; glass supported on dry long fiber felt over wide bearing surfaces; absolutely non-binding resiliency through phosphor bronze springs to allow for expansion and shocks.

(5) **To be Readily Accessible for Painting, Cleaning and Repairing**—Heavy brass dome nuts provide bearing for planks across top of skylight when workmen are making repairs; broken lights may be easily removed without disturbing other members; all parts accessible for cleaning and painting by removing lights.

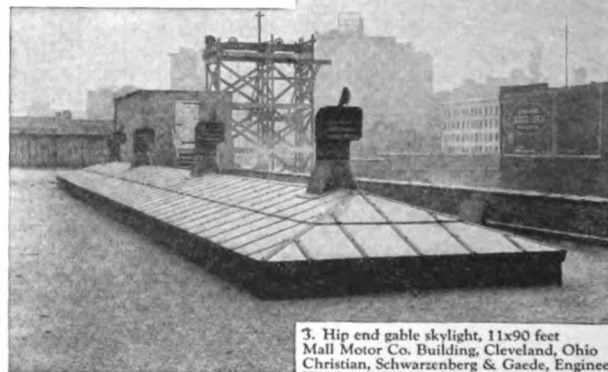
For railroad terminals, pickling rooms, galvanizing plants and other building where fumes and gases are present in unusual quantities, the Hauserman-System skylight is given an Hermastic coating or can be manufactured of Monel Metal, solid copper and brass or any other thoroughly indestructible material.



2. 4500 sq. ft. Hauserman-System Skylights.
C. A. Selzer Storeroom, Bulkley Building, Cleveland.



1. Battery of gable skylights with ventilators
Morris Plan Bank Building, Cleveland
Franz Warner, Architect
Central States Eng. & Const. Co., Contractors

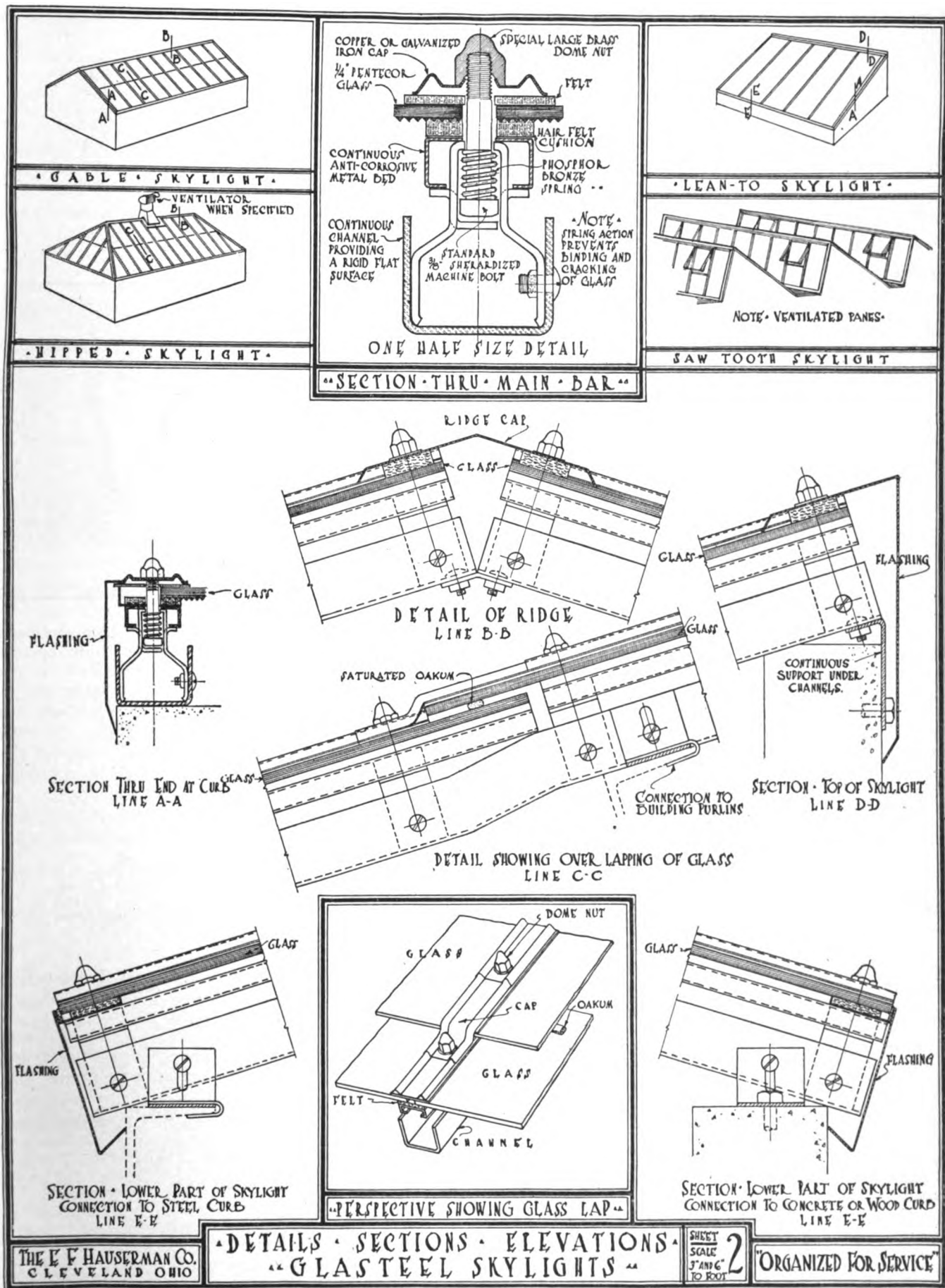


3. Hip end gable skylight, 11x90 feet
Mall Motor Co. Building, Cleveland, Ohio
Christian, Schwarzenberg & Gaede, Engineers
The Lundoff-Bicknell Co., Contractors

THE E. F. HAUSERMAN CO
CLEVELAND OHIO

“TYPICAL INSTALLATIONS”
“GLASTEEL SKYLIGHTS”

“ORGANIZED FOR SERVICE”



AMERICAN 3 WAY-LUXFER PRISM CO.

Manufacturers of Skylights

13th Street and 55th Court
CICERO, ILL.
(Suburb of Chicago)

139-141 Spring Street
NEW YORK, N. Y.

BRANCH OFFICES

DETROIT, MICH., 400 Penobscot Building
ST. LOUIS, MO., A. C. WRIGHT, 1944 Louisiana Avenue

KANSAS CITY, MO., E. P. WILKINS, Ridge Arcade
BOSTON, MASS., 453 Washington Street

WESTERN REPRESENTATIVES

CALIFORNIA: WATERHOUSE-WILCOX Co., 523 Market Street, San Francisco, Cal., and 331 Fast Fourth Street, Los Angeles, Cal.
WASHINGTON AND OREGON: D. E. FRYER & Co., Lumber Exchange Building, Seattle, Wash.; Tacoma, Wash., and Portland, Ore.

Representatives in All Large Centers

Products

3-WAY SIMPLEX REINFORCED CONCRETE SKYLIGHT CONSTRUCTION; STEELEAD SKYLIGHT CONSTRUCTION; 3-WAY LONG SPAN SKYLIGHT CONSTRUCTION.

Also manufacturers of Luxfer Skylight and Floor Light Construction.

3-Way Simplex Skylight Construction

3-Way Simplex skylights are built in complete factory-made slabs or in preformed slabs of double reinforced concrete to be finished on the job. Can be installed by any experienced cement man.

Advantages—

Great daylight area	Weatherproof
No upkeep expense	Fire resisting
No protecting screen	Everlasting
Great strength	No rusting
Burglarproof	

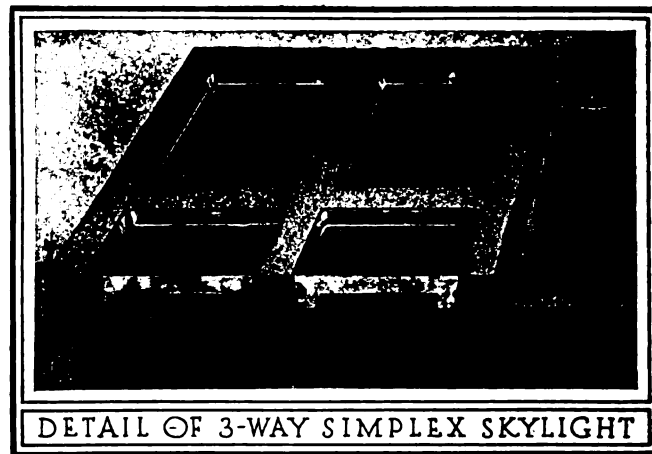
Adaptability—The factory-made slabs—pre-formed or completed—of the 3-Way Simplex construction are adapted to any installation or location. Have a tested strength of 700 lbs. per sq. ft. on a 6-ft. clear span, supported ends only. Underside of all soffits and the glass surface is very attractive and needs no other finish. Top is weather resisting and absolutely smooth. No exposed metal, so no need of paint. Needs no protecting screen. Because of strength it is unequalled for floor lights.

Erection—3-Way Simplex skylights should be installed in the gable or “dog-house” or lean-to construction. If flat, raised on copings to allow for expansion and making joints watertight. For this reason the company prefers to have its own skilled men install.

Construction—Designed and built on the most approved lines, 3-Way Simplex is without a fault. Does not rust and never needs paint. $1\frac{1}{2}$ -in. steel I-bars are interlaced with $\frac{3}{8}$ -in. deformed rods, each spaced $7\frac{3}{8}$ in. on centers. Around this reinforcing is poured the concrete, leaving 6-in. square holes for the glass. After this preformed slab is finished and in place, the glass is set and the concrete top is poured and finished.

Reground Cement—Because coarse ordinary cement slakes and sets *after* hardening, causing surface cracks and such internal pressure that glass is broken, we use *reground cement only*. This is so fine that 98% will pass through a 200-mesh screen. Concrete made with this is so dense and waterproof and so completely slaked that there is no internal pressure.

Polariscoped Glass—All lenses are $6\frac{1}{8}$ in. square, $\frac{3}{8}$ in. thick; heavy enough to be walked on safely and needing no protecting screen. Glass is of the famous Lazalite mixture that does not change color under action



DETAIL OF 3-WAY SIMPLEX SKYLIGHT

of the elements. Each lens is tested under the polariscope which shows up all stresses and strains, and only perfect glasses are accepted. These are faults invisible to the naked eye and are revealed only by the polariscope.

Replaceable—Lenses broken by accident are simply and easily replaced without chipping concrete.

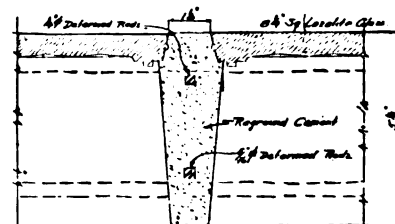
Details—On the opposite page are a few of the standard details of 3-Way Simplex skylight construction. Write for full details and specifications.

Installations—Among the thousands of buildings fitted with 3-Way Simplex skylights are the following well-known structures:

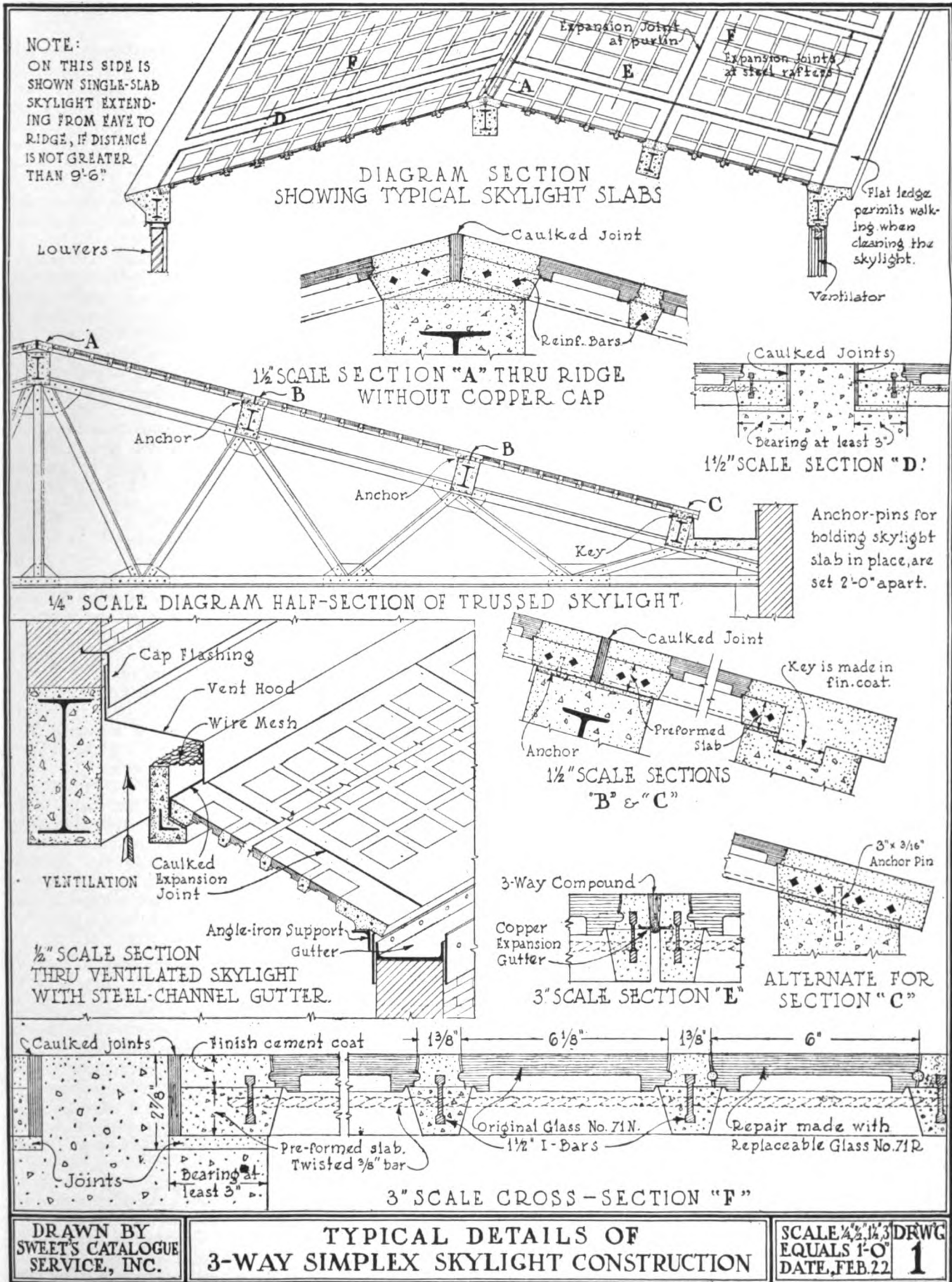
Union Station, Kansas City, Mo.; General Motors Building, Detroit, Mich.; Borland Industrial Buildings, Chicago, Ill.; Union Depot, Dallas, Tex.; Lackawana Terminal, Buffalo, N. Y.; Illinois Bell Telephone Co., Chicago, Ill.; Spink Arms Hotel, Indianapolis, Ind.

3-Way Long Span Reinforced Concrete Construction

A double reinforced concrete construction made with reground cement and using $8\frac{1}{4}$ -in. square lenses of Lazalite polariscoped glass. This construction is especially designed to be used where internal beams are not required or wanted. Its great strength means long spans without pillars or bearing beams. Glass is $8\frac{1}{4}$ in. square, spaced $9\frac{3}{8}$ in. on centers. Webs of reinforcing are $5\frac{1}{4}$ in. deep with two reinforcing bars in each. Write for details and complete specifications.



DETAILS OF 3-WAY LONG SPAN REINFORCED CONCRETE CONSTRUCTION



Steelead Skylight Construction

Steelead is the one all-metal skylight bar without a fault. Made of a steel "T" bar completely incased in a seamless lead sheath, it can be installed in any place where a sheet metal skylight has formerly been specified and in many places where the latter could not be used.

Advantages—Everlasting—Seamless lead sheath resists water, steam, gases, fumes, smoke, acids, electrolytic action. Does not rust or deteriorate in any way.

No Upkeep Expense—Because of weather resisting lead surface, Steelead never needs paint. No putty or packing to replace.

Economical—No underframe to build, no replacement ever needed, no painting. Broken glass replaced instantly.

Construction—Steelead is a steel "T" bar completely incased in a seamless sheath of pure lead. This is so formed that a lead seat is provided for the glass and the glass is held in place by lead webs or wings:

This lead sheath is moulded by our patented process into the special form we have produced to give it the greatest efficiency as a skylight construction.

Note from the illustration that the seat for the glass is moulded to a sharp edge so that the weight of the glass, bearing thereon, will settle it into a perfectly tight seat. The glass in place on this seat is held firmly in position by the wings or webs of pure lead which, moulded integral with the sheath, are pressed down on the glass. These are pressed firmly into the glass and these ribs fit closely into any unevennesses in the surface, forming an air seal closing the joint completely. The strength of these lead wings is such that the glass is held so securely that no pressure from below can loosen it, yet replacements of broken glass can be made without loosening a bolt, nut or screw.

Lead has the same adhesiveness to glass as rubber; therefore the longer the installation stands the tighter the joints get.

As an added precaution against leakage, the lead sheath is formed into a gutter under the edge of the glass, so that if any water should be driven under the lead web or wing it is caught and drained off through weep holes in the glass stop.

Because the glass rests on a seat of lead and is held in place by the lead wings or webs it is practically free from the effects of any vibration so that the greatest cause of breakage is removed, and it is absolutely rattle proof.

Moulded as part of the lead sheath are two small wings beneath the edge of the seat for the glass. In installing Steelead these wings are spread to form gutters. These are to catch and carry off the condensation. Weep holes are provided in the stops for this purpose.

Erection—Steelead is erected with no bolts, screws, pins or clamps on the outside. Glass is held without putty or packing. Every bit of exposed surface, caps, bars, ridges, flashings and gutters are pure, weather resisting, everlasting lead. All these are supplied by the company.

All Steelead bars are cut to exact size at the factory, and all auxiliary metal work is supplied ready for bolting together and into place. All that the other contractors do is to finish roof to curb. Curb plates are set; curb clamps attached; Steelead bars set in clamps and bolted together at ridge on "dog-house" skylights (or to ridge bar on lean-tos and one-slope skylights); curb

and gutter flashing of Hoyt hard lead placed; condensation gutters opened with special tool; ridge cap or flashing bolted in place—all metal work finished, ready to set glass.

If the span be over 4 ft., we recommend a joint in the middle because of the expense and impracticability of using glass of greater lengths. If glass is butt-jointed, we supply our special drain flashing for the joint. As far as the Steelead is concerned it can be used to almost any length with our improved form of reinforcing.

Both gable or hip skylights of Steelead can be built up to 8 ft. in width without any underframe or supporting bars to cast shadows.

Steelead is simpler and easier to erect than the average sheet metal skylight. Everything is supplied, including the flashings and glass, ready for setting in place. This can be done by any experienced sheet metal man.

Specifications should be included in the sheet metal contract.

Glazing—After all metal is set the glass is slipped to seat, and the lead wings or webs are pressed down on top with the special tool, the flashing pressed down and the job is complete. No putty, packing or paint needed to finish the job.

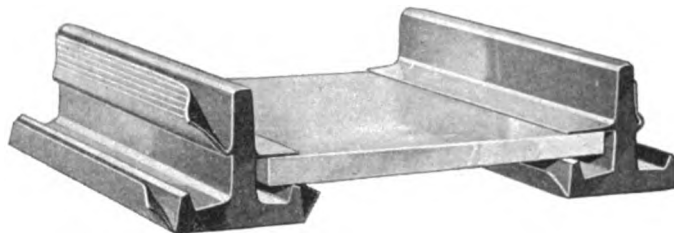
Replaceability—If a glass is broken by accident it is a matter of a few minutes of a glazier's time to bend up the lead webs or wings, slip another pane of glass into place and rub the webs down flat on the glass—no putty, no paint, no caps to remove and reset.

Strength—Steelead has far greater strength than any sheet metal skylight. In fact it is the strongest skylight made except the 3-Way Simplex and 3-Way Long Span, reinforced concrete constructions. While flexible enough to fold easily, the web which holds the glass in place is so stiff that it can not be loosened from beneath. A test of 360 lbs. on a light of glass of 5 sq. ft. was held in place entirely by the webs.

Adaptability—Steelead is the ideal metal skylight construction for its first cost is its last cost. It can be used to advantage in every skylight installation, large or small. Because of its gas and fume resisting qualities it is particularly satisfactory for railroads, chemical plants, ice plants, and factories of all kinds. Because of its strength a smaller bar will give a greater span with less shadow. Therefore it is unequalled for solariums, photograph studios, conservatories. Its total absence from upkeep cost and from leakage makes it the preferred construction for all public buildings, hospitals, schools, etc.

Ventilators—Stationary, revolving, or ridge type ventilators of any standard or approved make can be readily installed on Steelead skylights.

Specifications—(To be included in the Sheet Metal Specifications)—All skylights where shown on the plans shall be built of a lead covered steel "T" bar, so moulded that the steel is entirely covered by the seamless lead sheath. This lead sheath to be so formed that there is provided a lead seat for the glass and a gutter for leakage. Moulded integral with this sheath are to be two wings or flanges on each side of the bar: one $\frac{1}{4}$ in. wide on the heel of the bar and one 1 in. wide on the web of the bar. The smaller flange to be spread to provide a condensation gutter and the larger to be pressed down on the glass, waterproofing the joint and holding the glass in place securely. All flashing caps and ridges are to be sheet lead and supplied by the



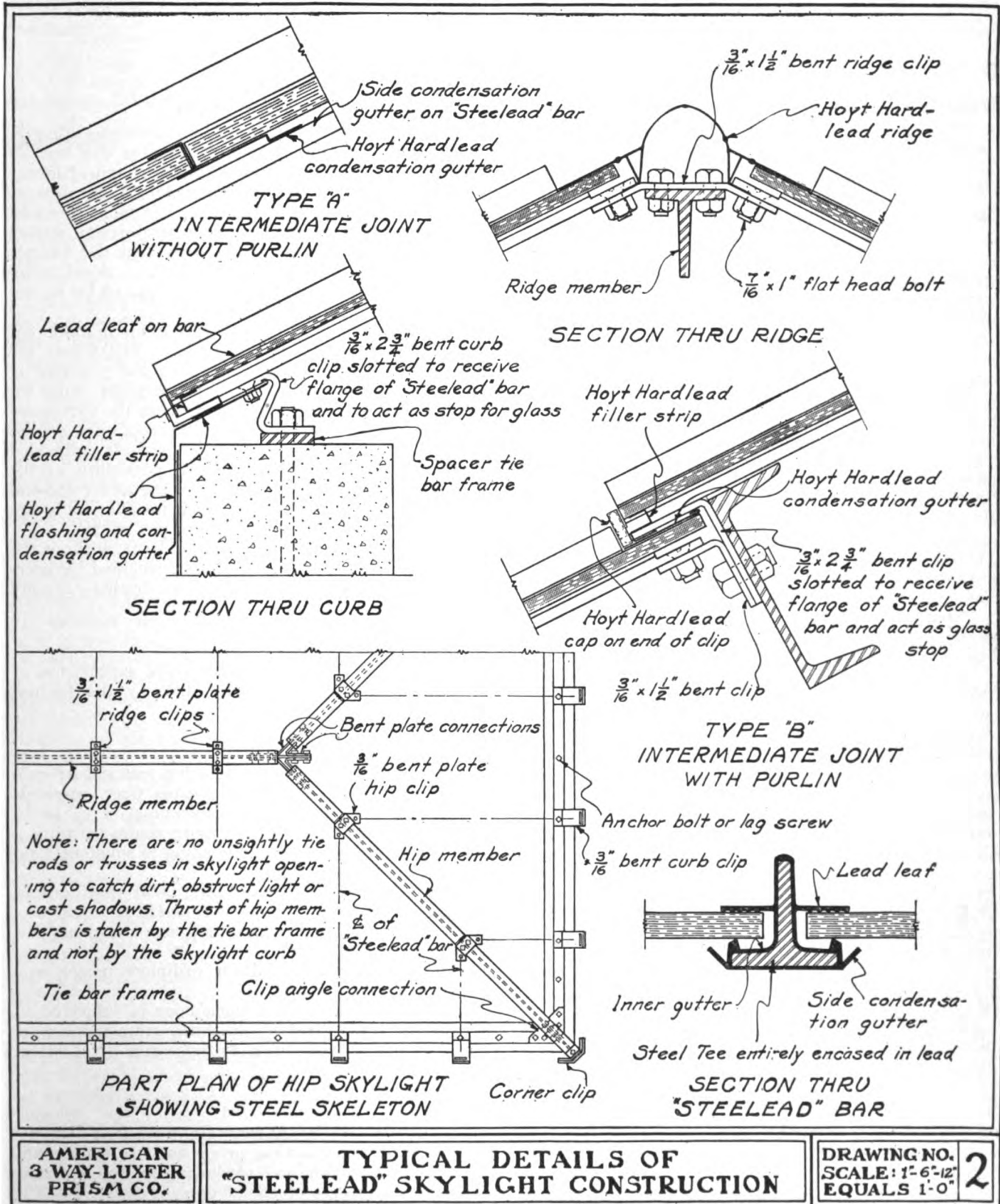
STEELEAD BARS—SHOWING METHOD OF GLAZING

manufacturer. This construction to be that known as Steelead as made by the AMERICAN 3 WAY-LUXFER PRISM Co. or other approved equal.

Recent Installations of Steelead Skylights

Roosevelt School, Fargo, N. D.
 Stearns Co. Court House, St. Cloud, Minn.
 Nashville Roller Mills, Nashville, Tenn.
 Strickler Building, Salina, Kans.
 Waseca Hospital, Waseca, Minn.
 J. Britz's Residence, Indianapolis, Ind.

State Capitol, Topeka, Kans.
 Police Headquarters, Detroit, Mich.
 Reynolds Spring Co., Jackson, Mich.
 Centenary Building, Nashville, Tenn.
 Electrical Laboratory, Lawrence, Kans.
 University of California Hospital, Berkeley, Cal.
 Filtration Plant, Sacramento, Cal.
 Roosevelt School, Seattle, Wash.
 Seattle National Bank, Seattle, Wash.
 San Joaquin Light and Power Co., Buttonwillow, Cal.
 Municipal Lighting Plant, Taunton, Mass.
 Beacon Theater, Boston, Mass.
 Armour & Co., Chicago, Ill.



ALBERT GRAUER & COMPANY

Skylights, Sidewalk Lights, Cement Finished and Mastic Floors

GENERAL OFFICE
646 East Columbia Street
DETROIT, MICH.

EASTERN OFFICE
Builders Exchange
CLEVELAND, OHIO

BRANCH OFFICES AND AGENCIES

ATLANTA, GA., STRAFFORD R. HEWITT
COLUMBUS, OHIO, THE B. M. FREEMAN Co.
DAYTON, OHIO, THE JOHN G. POOL Co.

FORT WAYNE, IND., JOCELYN-SCHULZ Co.
GRAND RAPIDS, MICH., RALPH E. SEEGER
INDIANAPOLIS, IND., GENERAL CONSTRUCTION SUPPLY Co.
PITTSBURGH, PA., J. WILLIS DALZELL Co.

Products

REINFORCED CONCRETE SKYLIGHTS; SIDEWALK LIGHTS; CEMENT FINISHED and MASTIC FLOORS.

Michigan representatives for the Nonpareil Skylight Co.

Bruner System of Reinforced Concrete Skylights

This system of skylight construction is the result of a number of years of experimenting by our Engineering Department to produce a skylight which would transmit as much light as the ordinary metal skylight and be so durable as to eliminate practically all maintenance charges. The expense of glass replacements is almost negligible and the construction has a life as long as that of the building itself.

Glass—The Bruner skylight has a glass area of 78.2%. Lenses are made of a special mixture, are thoroughly annealed and polariscope tested. Standard lenses are $8\frac{1}{8}$ in. square and $1\frac{1}{4}$ in. thick. Lenses are made in plain No. 10 and ornamental glass No. 11 and No. 12. Broken lenses can be easily replaced by the use of our patented repair lenses.

Bearings—The Bruner skylight construction requires a rabbet 5×5 in. on all four sides of opening or can be set on beams placed 5 in. below the finished roof level.

Spans—The Bruner skylight is designed to span up to 18 ft. clear without intermediate beams of any kind.

Loads—The Bruner skylight is designed to carry 100 lbs. per sq. ft. with a factor of safety of 4. The construction weighs approximately 40 lbs. per sq. ft.

Special Designs—We are especially equipped to design skylights and sidewalk lights to fill unusual requirements. Many railroad engineers as well as architects have availed themselves of this service with gratifying results. The Bruner system was introduced 29 years ago and is still conceded to be in advance of all other types by leading engineers. If you will send a sketch or a description of the problems our Engineering Department will make suggestions and drawings gratis.

Catalogue—Send for catalogue or blue prints.

Installation—We make prompt installations of Bruner skylights anywhere. We also make ready-to-set slabs shipped completely glazed to fit any opening; this obviates the possibility of a defective job due to the setting of the lenses by inexperienced labor.

Specifications—The reinforced concrete skylights shall be constructed in place according to the Bruner system, installed by ALBERT GRAUER & COMPANY. The glass shall be Bruner No. . . , $8\frac{1}{8}$ in. square. The construction shall span the openings without the use of intermediate beams, and shall be designed to carry a uniform load of 100 lbs. per sq. ft. The work shall be guaranteed to remain waterproof and in first class condition for 3 years from date of completion.

Bruner System of Sidewalk Lights

The Bruner system of reinforced concrete sidewalk lights, which we have been installing for the last 29 years, is the most efficient as well as economical means of daylighting basements, as attested by thousands of satisfied users throughout the United States. The fact that we have been using the same general design during a long term of years, tends to show that the Bruner system is built scientifically correct.

Practically all of the installations placed by us are giving first class service today.

The Bruner system of sidewalk lights is made entirely of reinforced concrete and glass. The glasses are placed on removable steel forms and the concrete is poured into these in a semiliquid condition, thus insuring a smooth, neat undersurface when the forms are removed. The reinforcing steel is accurately spaced and held in place by rustproof wire hangers embedded in the concrete. This eliminates all possibility of the reinforcements becoming exposed on the underside and rusting out. The steel area in each installation is figured to carry a live load of 300 lbs. per sq. ft.

A span from building to curb of 16 ft. without the use of any intermediate beams can be obtained. Watertight expansion joints are placed as needed—usually 10 to 15 ft. apart.

Cement Finished Floors

Careful selection of aggregates and supervision of workmen enable us to produce and lay the highest grade cement floor finish.

Mastic Flooring

A red, brown, or green surfacing material of rubberlike texture, composed of asbestos fiber, minerals and mineral oils, applied to a thickness of $\frac{1}{8}$ to $\frac{1}{4}$ in. laid with a trowel in 5 or more coats, forming a continuous seamless sheet and bonding to subfloor. Laid on wood, concrete or iron.

Properties—Perfectly elastic, will not crack, check, peel, crawl nor wrinkle; expands and contracts with base; is absolutely waterproof, non-absorbent and easily cleaned.

Types—Detroit Brand for ordinary usage, applied in 7 or more coats.

Filipite Brand for use when floor is subjected to extra heavy traffic, laid $\frac{1}{4}$ in. thick, same number of coats. When rubbed down to aggregate gives effect similar to terrazzo.

Guarantee

All floors laid by ALBERT GRAUER & COMPANY whether mastic, composition, or cement, are fully guaranteed as to materials and workmanship, for a period of 2 years from date of completion.

NATIONAL VENTILATING COMPANY

Manufacturers of Puttyless Skylights

GENERAL OFFICE AND FACTORY

75 Tenth Street

LONG ISLAND CITY, N. Y.

TELEPHONE

HUNTERS POINT 5733, 5734

Products

MULTI-UNIT PUTTYLESS SKYLIGHTS.

Also manufacturers of Side Lights, Operating Sash, and National Ventilating Devices.

Adaptability

Skylights for railway terminals, power stations, machinestops, factories, foundries, libraries, museums, art galleries, and all other buildings whereon permanent watertight skylights of large area are required.

Advantages and Distinctive Features

Referring to illustration, the bar and upper lights are supported in a fixed manner by the purlin thereunder; while the lower bar, supporting the lower lights, is secured by the same purlin in a loose manner, permitting it to expand freely.

This construction, being repeated at each purlin, permits movement, all in same direction, due to expansion, contraction, or vibration (along the slope of the skylight) of the cap, glass and bar of each unit or tier of glass, independently of every other unit or tier.

Along the longitudinal line of the skylight the steel frame of the building and the entire length of the glass are each taken as separate units, and the difference, nearly 100%, in the expansion and contraction of these materials (glass and steel) is likewise thoroughly taken care of by the copper spreader clips shown in transverse section at supporting bar. These spreader clips are placed over each cap bolt, spaced about 12 in. along each skylight bar, and, incidentally, they serve also to better secure in place the copper bolts for holding the caps.

The cap is strong and yet resilient. Its upper half is of an inverted "U" shape, which provides strength and rigidity; while the lower half, especially at the lower extremities, is resilient, so as to conform thoroughly, when secured in position, to the surface of the glass.

All gutters and parts that are non-accessible, without removing the glass, are of non-corrosive material. The entire top of the bar is covered with 8-oz. copper, the same being applied while the last coat of bar-paint is still wet; and a flexible bearing for the glass is formed, which adjusts itself to any warps or irregularities of the glass along its bearing line.

The company is equipped to cover the bottom of the bar also. Both the top and bottom bar covers

are made by special dies and both fit the bar snugly.

No packing or filling substance of any kind is required and no material is used other than glass and metal.

Installations

The Pennsylvania Railroad Co. adopted this construction for its New York City passenger station, on which building 83,000 sq. ft. of skylight were installed, embracing every known variety of construction.

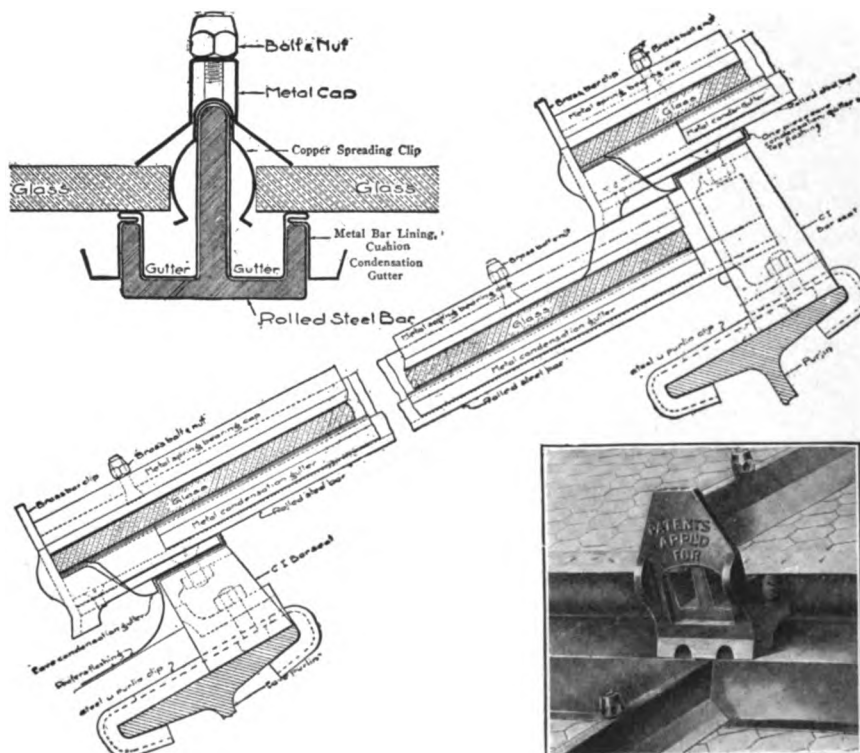
The Central Railroad of New Jersey also adopted this system for its new terminal at Jersey City, where 116,000 sq. ft. were installed.

The New York Central Railroad Co. has this construction on its Grand Central terminal at 42nd Street, and on powerhouses and passenger stations at various points.

Installations have been made on a number of large buildings in the United States Navy Yard at Washington, D. C., and Norfolk, Va.

A large number of industrial plants have also adopted this system as it has been found the most economical and satisfactory.

The Standard Arcade at 50 Broadway, New York, N. Y., has a curved roof skylight of this construction, which is a splendid example of its peculiar adaptability to any condition.



DETAILS OF MULTI-UNIT PUTTYLESS SKYLIGHTS

(Patents applied for)

Construction shown on the right side is repeated at each purlin between the eave and the ridge

THE AUTOMATIC VENTILATOR CO., INC.

1003-1005 Park Avenue
BALTIMORE, MD.

REPRESENTATIVES IN THE PRINCIPAL CITIES

Products

AUTOMATIC DRAFTPROOF WIND CLOSED VENTILATORS for installation in walls, windows, transoms, rolled steel factory sash, etc.

AUTOMATIC BACK-DRAFT DAMPERS equipped with counterbalanced louvers mounted in self-aligning ball bearings.

THE AUTOMATIC VENTILATOR
—makes your room breathe!
TRADE-MARK

room side of building, can be removed from its housing and replaced in a few seconds. No tools of any kind required. The accessibility of the insert makes it possible by an annual or semiannual dusting of screen to maintain 100% efficiency. Standard opening, 7x9 in.

The Automatic Ventilator

Principle—Balanced louvers or shutters normally held open by counterweights, closed by a gust of wind excluding draft, dirt, rain and snow. The weights which control the sensitiveness of the shutters are threaded on an extension of the shaft, bent at right angles, and secured on the principle of a locknut. When the counterweights are placed near the axis of the shaft, the louvers will close at the slightest wind pressure. As the counterweights are moved toward the end of the shaft, the resistance of the shutters to the wind is correspondingly increased. For installation in windows of any type, walls, transoms, hollow or rolled steel sash, etc. Copper screening prevents insects, etc., from entering.

Advantages—Low initial cost.

No operating or maintenance cost.

Simplicity and economy of installation.

Can be built in exterior wall or installed in windows or transoms of any construction.

Made of copper; can not rust or corrode.

No draft, entirely automatic. Operate 24 hours daily without attention, regardless of outside weather conditions.

Weatherproof.

Description—*The Insert*—The louver assembly, holding all moving parts, is a separate unit known as the "insert" (Fig. 1), an automatic ventilator being made up of one or more of these units. The insert consists of a screened copper frame in which are mounted aluminum louvers on brass pivots, rotating in copper bearings. The insert, easily accessible from the

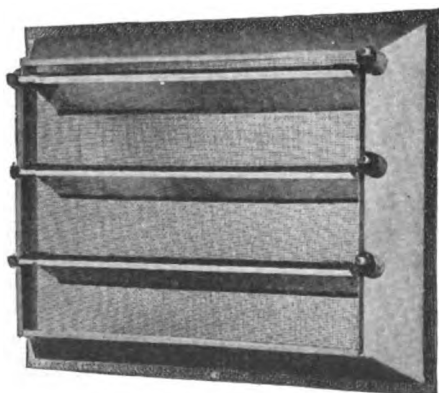


FIG. 1. THE INSERT

Types of Automatic Ventilators

Box Type—Fig. 2. Equipped with 1, 2 or 3 inserts having area of 63, 126 and 189 sq. in., respectively.

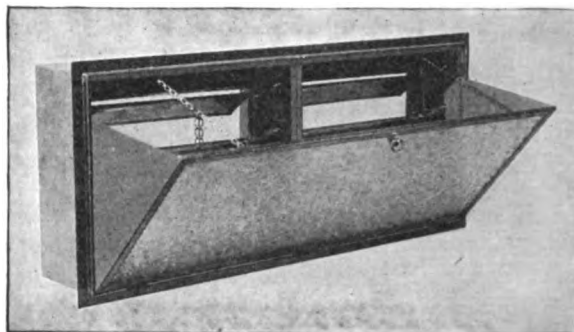


FIG. 2. DOUBLE INSERT, BOX TYPE VENTILATOR

Fig. 2 illustrates the appearance from the room side. An inexpensive, highly efficient unit, substantially built of heavy gauge copper. Louvers are of aluminum, mounted on brass pivots.

DIMENSIONS OF AUTOMATIC DRAFTPROOF VENTILATORS

Number of inserts	Height, in.	Depth, in.	Length, in.	Width flange, in.	Over-all length, in.
1	9 3/4	4 1/2	11 3/4	1 1/2	12 3/4
2	9 3/4	4 1/2	24	1 1/2	25
3	9 3/4	4 1/2	36	1 1/2	37

A door deflects the air upward and can be adjusted to any desired angle. When closed, the door is flush with the wall.

This type is either built in the wall or mounted above a transom bar in the window opening.

Industrial Type—Fig. 3. Designed for installation in rolled steel factory sash. Carried in stock in standard glass sizes. Contains two standard inserts giving area of 126 sq. in.

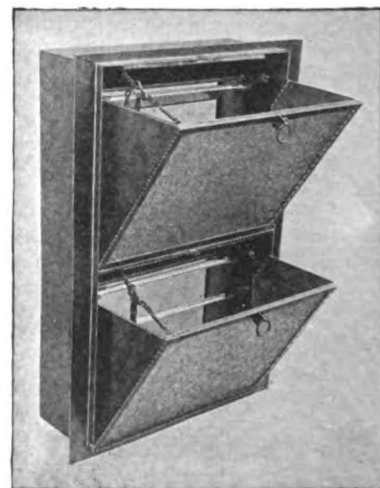


FIG. 3. INDUSTRIAL TYPE VENTILATOR

A logical, efficient ventilator for industrial plants. Large capacity without draft. Requires no attention or adjustment of any kind. No operating cost. Will last a lifetime.

Ball Bearing Type—Fig. 4. All louvers over 12 in. in length are mounted in self-aligning, dustproof ball bearings. Ball bearings operate in oil, insuring maximum sensitiveness, efficiency and durability. Shafts, weights, etc., are solid brass; all screws used in assembly are brass; aluminum louvers; can not corrode; nothing to wear out.

Designed for installation in factories, theaters, schools, hospitals, corridors, etc., where large air movement capacity is required. Carried in stock with openings up to 1600 sq. in. Multiple units give any larger area desired. No superstructure is required. Ventilators can be built in the wall, skylights, or mounted in rolled steel sash.

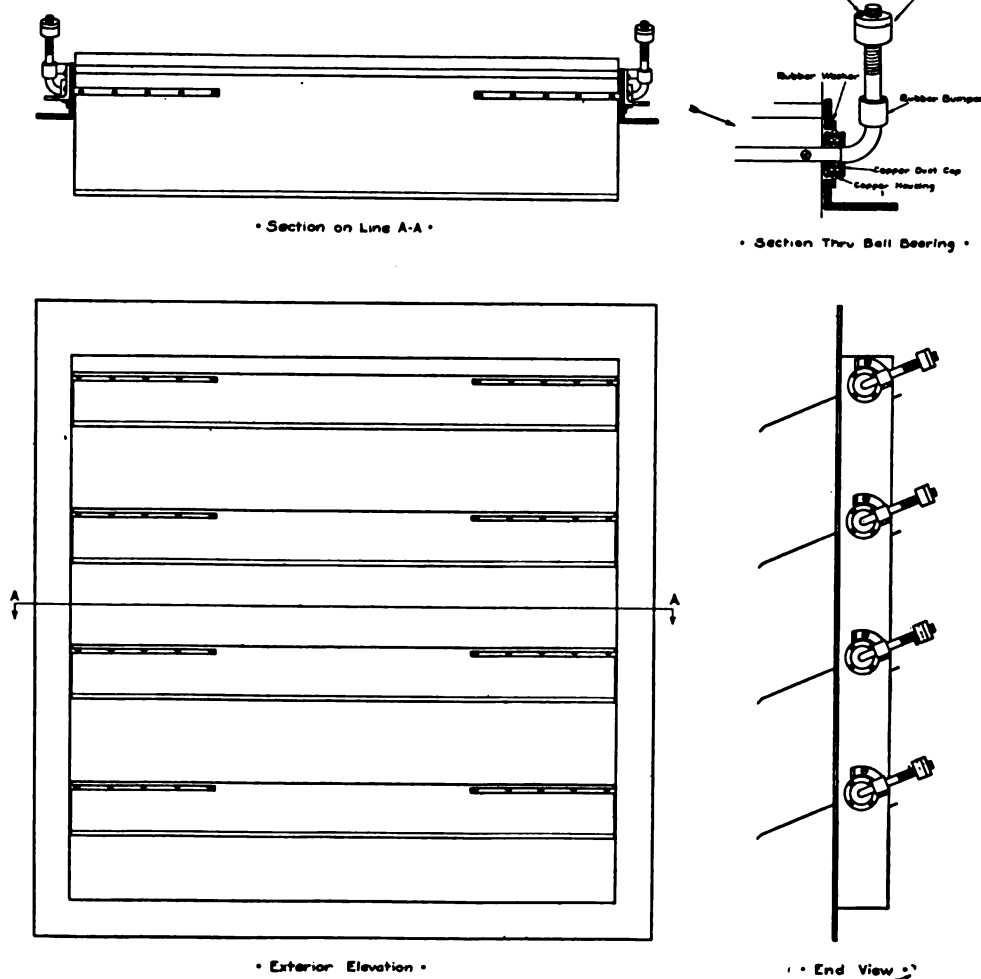


FIG. 4. BALL BEARING TYPE VENTILATOR OR BACK-DRAFT DAMPER
Shutters in open position

Back-draft Dampers

With the exception of the modification in the balance, Automatic back-draft dampers for exhaust outlets are constructed the same in every particular as our ball bearing ventilator. The shutters are normally closed, excluding all back-draft and weather, but open instantly at the slightest air pressure from the inside. Extreme sensitiveness, maximum efficiency and durability insure satisfactory results.

Window Type Ventilators

The Automatic window ventilator (Fig. 5) is designed for installation at the top of windows equipped with double hung sash, attached to the frame outside of the sash.

It does not interfere with opening, closing or locking the window. Made in all sizes, single, double and triple insert type.

Panels fitted with Florentine glass unless otherwise



FIG. 5. DOUBLE INSERT WINDOW TYPE VENTILATOR

specified, but can be furnished in any style or pattern desired. Ornamental, inexpensive.

Application of Automatic Ventilating Systems

Automatic ventilating systems are particularly recommended for industrial plants, schools, hospitals, office buildings, banks, restaurants, theaters and concert halls, etc. Built in any shape and size to harmonize with any type of architectural design or finish.

AMERICAN-LARSON VENTILATING COMPANY

CABLE ADDRESS
"AMVECO"

850 West North Avenue
PITTSBURGH, PA.

CODES USED
Western Union
and Lieber

BRANCH OFFICES IN NEW YORK, SAN FRANCISCO, AND ALL PRINCIPAL CITIES

Product

AMERICAN-LARSON SUCTION VENTILATOR.

Ventilating Service

The installation of ventilators and ventilating systems has its peculiar angles and its individual problems which should have the attention of trained minds.

We, therefore, place at your service our corps of ventilating engineers. We solicit an opportunity to serve as ventilating counselors, and welcome actual tests against any ventilator in existence, under your supervision.

Most Economical

The American-Larson ventilator is surprisingly inexpensive; costs no more than any other and less than some. Because of its tremendous exhaust, half the number of proportionately smaller sizes are required for desired results. Thus considerable savings are effected by eliminating unnecessary ventilators, by minimizing the number of holes in the roof, and by reducing transportation and installation costs. The first cost of the American-Larson is the only cost.

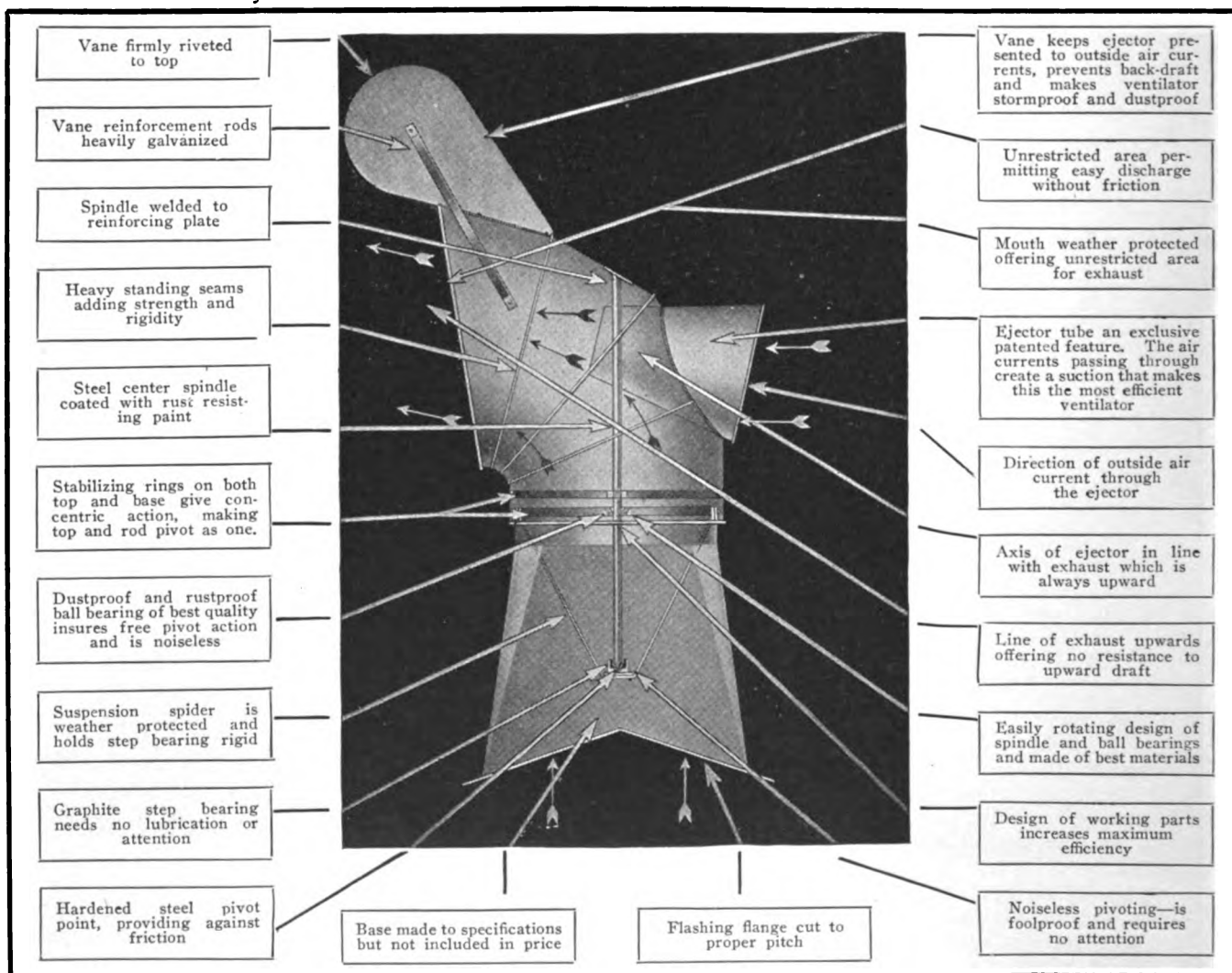
Scientific Design

It is the first ventilator designed on the siphon principle that applies that principle in a logical way, insuring maximum efficiency under all conditions. The American-Larson Suction Ventilator consists of a pivoted elbow cowl having its mouth inclined in a slightly upward direction. Inserted in the back of this cowl is a cone-shaped tube with its axis parallel to the line of discharge. The vane keeps the suction tube in alignment with the slightest change in the direction of the air currents. The air currents rushing through the cone-shaped tube into the larger space of the cowl by this siphon action induce an up-draft in the neck of the ventilator.

First Class Construction

The American-Larson ventilator is made of the best materials, ingot iron, toncan, Keystone or equivalent.

The graphic illustration on this page gives a full description. There are no shutters or louvers to break off; no meaningless fancy trimmings to impede the ventilating action; nothing to rattle or wear out; nothing to get out of order. It outlasts any other ventilator.



AMERICAN-LARSON SUCTION VENTILATOR



A BATTERY OF AMERICAN-LARSON VENTILATORS AT ERIE MALLEABLE IRON WORKS, ERIE, PA.



AMERICAN-LARSON VENTILATORS ON PENNSYLVANIA R. R. STATION, NEW YORK, N. Y.

Superior Points

In 8 years use by the largest corporations in the United States and Canada, the American-Larson Suction Ventilator has proved itself to be the most efficient of its type. It gives constant, positive, and uniform ventilation whenever all other means and devices fail.

First: It is the most efficient, harnessing the breeze to induce an up-draft.

Second: It will exhaust more air for less money.

Third: It will remove heavy fumes and steam heretofore requiring power ventilation.

Fourth: It is stormproof and dustproof, and requires no attention.

Fifth: It pivots freely when it comes to you, and keeps on doing so for its full life.

Sixth: It will not back-draft even under the most unfavorable conditions.

Seventh: Its first cost is the only one.

Adaptability

The American-Larson is the ideal ventilator for mills, factories, foundries, warehouses, schools, theaters, power plants, train sheds, barns, railway cars, ships, etc.; for completely and quickly removing foul air, warm air, fumes, gases, vapor, steam, smoke.

Install it on flat roofs, slant roofs, sawtooth roofs; on skylights, monitors, etc.; everywhere pure air benefits living beings; everywhere vitiated air contaminates perishable products; everywhere a rapid change of air or temperature is required.

Guaranteed Capacities

Base specifications on the reliable, accurate official figures below. Made with inspected anemometers approved by the United States Government.

Following are the guaranteed capacities of American-Larson suction ventilators, the breeze velocity being 5 miles per hour:

Size, in.	Cu. ft. per hour	Size, in.	Cu. ft. per hour
8	11,500	30	161,700
10	17,820	36	232,890
12	24,800	40	287,760
14	34,980	48	412,500
16	46,200	54	524,700
18	58,410	60	646,800
20	71,940	66	782,100
24	103,620		

Partial List of Prominent Installations and Users

American Sugar Refining Company, Baltimore, Md.
 Baldwin Locomotive Works, Philadelphia, Pa.
 Brown & Sharpe Mfg. Co., Providence, R. I.
 Buffalo, Rochester & Pittsburgh Ry., Rochester, N. Y.
 Clinton Wire Cloth Co., Clinton, Mass.
 Duquesne Light Company, Pittsburgh, Pa.
 Edison Storage Battery Co., New York, N. Y.
 Erie Malleable Iron Works, Erie, Pa.
 General Electric Co., Schenectady, N. Y.
 Hyatt Roller Bearing Co., Detroit, Mich.
 National Lock Washer Co., Newark, N. J.
 Navarre Hotel, Newark, N. J.
 National Tube Co., Pittsburgh, Pa.
 New York & Pennsylvania Co., Johnsonburg, Pa.
 Pennsylvania R. R. Co., Trenton Shops
 Shawmut Paving Brick Co., St. Marys, Pa.
 Standard Oil Co., Eagle Works, Jersey City, N. J.
 Turner Construction Co., New York, N. Y.
 United States Metal Products Co., San Francisco, Cal.
 United States Navy Yard, Brooklyn, N. Y.

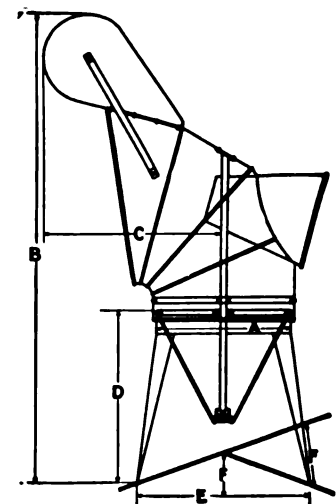
DIMENSIONS IN INCHES, GAUGES, WEIGHTS, PRICES AND CODE WORDS

A in.	B in.	C in.	D in.	E in.	Iron gauge	List price, damper	List price, ventilator	Net weight, lbs.	Crated weight, lbs.	Code word
8	27 ¹¹ / ₁₆	10 ¹¹ / ₁₆	10 ¹¹ / ₁₆	10 ¹¹ / ₁₆	24	\$ 1.50	\$ 18.00	12	26	Amen
10	34 ¹¹ / ₁₆	13 ¹¹ / ₁₆	12 ¹¹ / ₁₆	12 ¹¹ / ₁₆	24	2.15	22.00	18	35	Amable
12	41 ¹¹ / ₁₆	16	13 ¹¹ / ₁₆	13 ¹¹ / ₁₆	24	2.90	30.00	26	46	Amend
14	48 ¹¹ / ₁₆	18 ¹¹ / ₁₆	17 ¹¹ / ₁₆	17 ¹¹ / ₁₆	24	3.30	35.00	32	57	Amity
16	55 ¹¹ / ₁₆	21 ¹¹ / ₁₆	20 ¹¹ / ₁₆	20 ¹¹ / ₁₆	24	3.80	40.00	39	70	Amid
18	62 ¹¹ / ₁₆	24	21 ¹¹ / ₁₆	21 ¹¹ / ₁₆	24	4.30	45.00	49	85	Amis
20	69 ¹¹ / ₁₆	26 ¹¹ / ₁₆	25 ¹¹ / ₁₆	25 ¹¹ / ₁₆	22	4.80	50.00	68	115	Amerce
24	83 ¹¹ / ₁₆	32	30 ¹¹ / ₁₆	30 ¹¹ / ₁₆	22	5.80	60.00	92	145	Amulet
30	103 ¹¹ / ₁₆	40	38 ¹¹ / ₁₆	38 ¹¹ / ₁₆	20	7.15	75.00	146	206	Amuse
36	125 ¹¹ / ₁₆	48	46 ¹¹ / ₁₆	46 ¹¹ / ₁₆	20	9.30	110.00	225	325	Amour
40	139 ¹¹ / ₁₆	53 ¹¹ / ₁₆	51 ¹¹ / ₁₆	51 ¹¹ / ₁₆	20	11.50	140.00	282	412	Amaze
48	167 ¹¹ / ₁₆	64	61 ¹¹ / ₁₆	61 ¹¹ / ₁₆	20	17.00	170.00	390	560	Amass
54	187 ¹¹ / ₁₆	72	63 ¹¹ / ₁₆	63 ¹¹ / ₁₆	18	20.00	220.00	620	820	Amazon
60	208 ¹¹ / ₁₆	80	76 ¹¹ / ₁₆	76 ¹¹ / ₁₆	18	25.00	300.00	790	1025	Amain
66	229 ¹¹ / ₁₆	88	84 ¹¹ / ₁₆	84 ¹¹ / ₁₆	18	35.00	375.00	930	1215	Ammonia

Code: Ship at once by freight.....Amethyst
 Ship at once by express.....Amplify
 Price, f. o. b. Pittsburgh.....Amount

Price, f. o. b. destination.....Ambrosia
 How soon can you ship?.....Amateur

For "A," "B," "C," "D," and "E," see dimension drawing. In ordering, only dimension "A" is required.



ALLEN AIR-TURBINE VENTILATOR CO.

8th and Porter Streets
DETROIT, MICH.

Product

ALLEN AIR-TURBINE VENTILATOR.

Description

The Allen air-turbine ventilator is a true *rotary air driven suction turbine* combining all the merits of the power driven systems without the heavy initial cost and continuous operating expense. The perfectly balanced turbine actuated by the air pulls up and ejects the foul air, gas, dust or moisture. This ventilator is absolutely leakproof; its operation is not hampered by ice, sleet or rain. This constant operation under all conditions insures positive and *uniform* ventilation. The powerful upward suction force of the rotary turbine makes *down-drafts a mechanical impossibility*. It is noiseless in operation and once installed requires no attention, care or adjusting.

This ventilator is constructed of standard gauge, rust resisting, galvanized sheet metal or cold rolled copper and will stand long and continuous service.

Test

The following table showing the air lifting or displacement power of Allen air-turbine ventilators was compiled from a record of displacement tests of the Allen air-turbine ventilator made by the engineering department of the largest industrial corporation of its kind in the world. The displacement figures are guaranteed.

DISPLACEMENTS OF ALLEN AIR-TURBINE VENTILATORS

Diam. of throat, in.	Air displacement, cu. ft. per hour		Diam. of throat, in.	Air displacement, cu. ft. per hour	
	Wind velocity, 4 miles per hr.	Wind velocity, 8 miles per hr.		Wind velocity, 4 miles per hr.	Wind velocity, 8 miles per hr.
8	17,300	21,600	24	149,000	185,000
10	26,500	32,500	30	225,000	272,000
12	38,600	46,200	36	281,000	330,000
15	54,000	69,000	42	324,000	414,000
18	85,200	102,100	48	360,000	473,000
20	105,100	125,600			

Uses

The Allen air-turbine ventilator is especially adapted for removing excessive heat and foul air from churches, schoolhouses, hotels, theaters, residences and public buildings; for ejecting *steam and gases* from factories,



ALLEN AIR-TURBINE VENTILATOR

mills, foundries, laundries and garages, and for expelling foul air, moisture, odors and dust from barns, stables, etc.

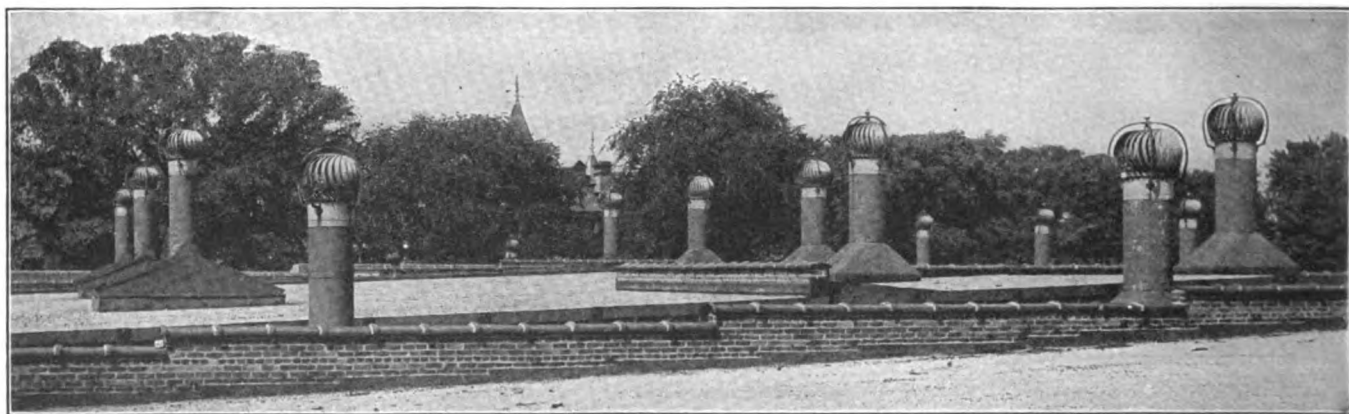
The sizes of ventilators shown in the table below are standard. Bases are made to suit conditions.

Service

Problems of installation submitted to our Engineering Department will receive expert attention.

Just a Few of the Many Detroit Installations

Acme White Lead & Color Works	Detroit Oak Belting Co.
Banner Laundry	Detroit Pressed Steel Co.
Briggs Mfg. Co.	Detroit Twist Drill Co.
City of Detroit:	Ford Motor Co.
Belle Isle Aquarium	General Aluminum & Brass Co.
Belle Isle Stables	Harper Hospital
Board of Education	House of Providence Hospital
Police Dept., Garage	MacDiarmid Candy Co.
Crosstown Garage	Michigan State Telephone Co.
Detroit City Gas Co.	Miles Theater
Detroit Creamery Co.	Parke-Davis & Co.
Detroit Edison Co.	Timken-Detroit Axle Co.
	Wagner Baking Co.



ALLEN AIR-TURBINE VENTILATORS INSTALLED ON CROSSTOWN GARAGE, DETROIT, MICH.

AREX COMPANY

Industrial Ventilating Engineers

1598 Conway Building
CHICAGO, ILL.

BRANCH OFFICES IN ALL PRINCIPAL CITIES

TELEPHONE
FRANKLIN 5453

FACTORIES
SOUTH GARY, IND.
PHILADELPHIA, PA.
BRANTFORD, ONT., CAN.

Products

AREX ORIGINAL SIPHONAGE ROOF VENTILATOR.
Also manufacturers of Arin Antidraft Window Ventilators.

Arex Siphonage Roof Ventilator

This ventilator assures, by natural means, constant, positive, uniform ventilation for any kind of buildings—mills, factories, foundries, warehouses, power plants, train sheds, etc. Foul air, warm air, fumes, gases, vapors, steam and smoke quickly and completely removed.

Description—Passing wind plays upon the siphons so as to accelerate the outflow of foul air from interior of building, but it permits none of the outside wind to enter the ventilator. Every opening an outlet.

Of galvanized iron, ingot or Toncan metal, cold rolled copper or any other special metal in any size or gage. Brass bolts connecting the frustum to the siphons permit installation in two halves and facilitate painting inside and outside after installation.

Advantages—Down-drafts impossible; constant, positive ventilation assured; 300% greater air exhaust obtained; half the number of ventilators required. No cost for maintenance or operation; every joint securely riveted; no solder used; no movable parts; the whole is one strong, solid piece. Approved by leading architects and engineers; also by government officials.

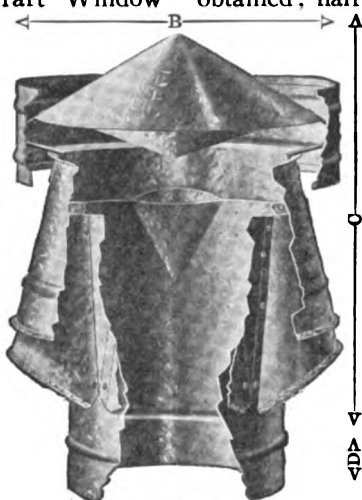
How to Specify—Simply multiply cubical contents of room by number of air changes required per hour. The capacity table will tell exact size and number of Arex to use.

Shipments—Prompt shipments from large stock.

Co-operative Service

Installations shown below are standard; special bases and pipe connections to order. Submit sketch.

The Arex Engineering Department gladly offers expert advice on any ventilating problem without obligation.



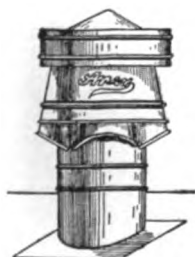
SECTIONAL VIEW OF AREX VENTILATOR

Showing siphonage system and extraordinary outlet for escape of air

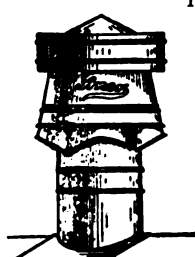
AREX VENTILATOR DATA

Principal dimensions, in.				Area, sq. in.	Exhaust per hour, cu. ft.	Approximate shipping wt. lbs.	Gage of metal	Price, galvanized, f. o. b. factories		Price, ingot iron, Toncan, Keystone or equivalent		Price, copper					
A	B	C	D					Dampers	Ventilators	Dampers	Ventilators	Light			Medium		
												Wt. os.	Dampers	Ventilators	Wt. os.	Dampers	Ventilators
6	9	12	1 1/2	28	9425	7	26	\$2.40	\$10.00	\$2.64	\$11.00	12	\$2.93	\$13.70	16	\$3.08	\$15.77
7	10 1/2	14	1 1/2	38	12828	11 1/2	26	2.50	11.00	2.75	12.10	12	2.99	14.96	16	3.14	17.03
8	12	16	1 3/4	50	16755	14	25	2.90	12.00	3.19	13.20	12	2.99	18.65	16	3.14	20.69
9	13 1/2	18	2	64	21206	16 3/4	26	3.40	13.00	3.74	14.30	12	3.31	21.55	16	3.48	23.55
10	15	20	2 1/4	79	26180	20	24	3.70	14.00	4.07	15.40	14	4.44	22.62	18	4.66	24.63
12	18	24	2 3/4	113	37699	28	24	4.40	16.00	4.84	17.60	14	5.26	28.10	18	5.52	30.27
14	21	28	2 3/4	154	51313	38	24	5.00	18.00	5.50	19.80	16	5.95	40.73	20	6.25	44.45
16	24	32	3	201	67021	54	24	5.60	22.00	6.16	24.20	16	6.71	49.46	20	7.05	54.27
18	27	36	3 1/4	254	84823	68	24	6.00	26.00	6.60	28.60	16	8.38	58.50	20	8.80	64.70
20	30	40	3 1/2	314	104720	93	22	6.90	32.00	7.59	35.20	16	9.61	65.30	20	10.09	72.17
22	33	44	3 3/4	380	126711	108	22	7.50	38.00	8.25	41.80	16	10.14	86.13	20	10.55	90.22
24	36	48	4	452	140796	130	22	8.40	44.00	9.24	48.48	16	11.62	91.73	20	12.20	101.37
26	39	52	4 1/4	531	176976	155	22	9.40	52.00	10.34	57.20	18	13.07	112.33	22	13.72	134.82
28	42	56	4 1/2	616	205251	186	22	9.60	61.00	10.56	67.10	18	13.95	135.89	22	14.65	152.55
30	45	60	4 3/4	707	235619	225	20	11.80	72.00	12.98	79.20	20	16.46	157.53	24	17.28	177.03
36	54	72	5	1018	339293	405	20	13.80	99.00	15.18	108.90	20	19.09	235.40	24	20.04	265.55
42	63	84	5 1/4	1385	461813	475	20	16.90	147.00	18.59	161.70	20	23.50	325.66	24	24.68	364.77
48	72	96	5 1/2	1810	603187	620	20	21.20	198.00	23.32	217.60	24	27.48	511.72	28	30.95	591.10
54	81	108	5 3/4	2290	763407	890	20	25.40	280.00	27.94	308.00	32	39.69	655.98	36	43.66	721.58
60	90	120	6	2827	942477	910	18-20	30.50	393.00	33.55	434.50	36	46.32	1000.05	40	50.95	1100.06
66	99	132	6 1/4	3421	1140397	1060	18-20	36.20	540.00	39.82	594.00	36	64.83	1253.01	40	71.31	1378.31
72	108	144	6 1/2	4072	1357107	1450	16-18	41.50	698.00	45.65	767.80	40	68.79	1602.18	48	75.67	1762.40
84	126	168	6 3/4	5542	1847256	2225	14-16	56.90	1125.00	62.59	1237.50	42	87.30	2337.42	48	96.03	2575.16
96	144	192	7	7238	2412743	3400	14	73.70	1610.00	81.07	1771.00	48	108.48	3424.23	60	119.33	3766.65
108	162	216	7 1/4	9161	3053626	5900	12-14	92.90	2185.00	102.19	2403.50	48	153.45	4450.62	60	168.80	4895.68
120	180	240	7 1/2	11310	3769900	7600	12-14	114.50	2930.00	125.95	3223.00	60	201.09	6416.45	72	221.20	7498.10
132	198	264	7 3/4	13685	4561621	10600	12	138.50	3690.00	152.35	4059.00	72	277.83	9952.92	84	305.61	10948.21
144	216	288	8	16286	5428667	11825	12	164.90	4575.00	181.39	5032.50	72	357.21	12790.30	84	392.93	14058.38

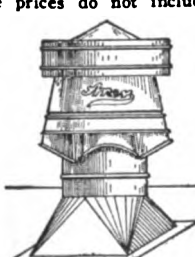
These prices do not include bases, condensation arresters, or dampers



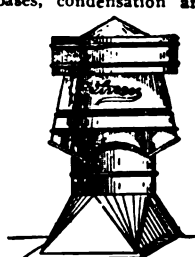
No. 3
Round Base for Slant
Roof



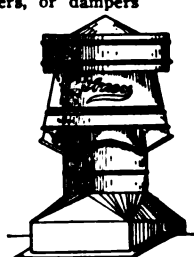
No. 5
Round Base for Gable
Roof



No. 8
Square to Round Base
for Slant Roof



No. 9
Square to Round Base
for Gable Roof



No. 12
Square to Round Base
with Shoulder for
Gable Roof



No. 13
Round Base for Flat
Concrete Roof with
Angle Iron Ring
at Bottom

TYPICAL STANDARD INSTALLATIONS OF AREX ORIGINAL SIPHONAGE VENTILATORS

GLOBE VENTILATOR COMPANY

205 River Street
TROY, N. Y.

Products

Sole manufacturer of "GLOBE" DOME TOP SUCTION VENTILATORS and "GLOBE" CHIMNEY CAPS.

Also "Globe" Ventilated Ridging; Barn Birdproof Ventilators; Special "Globe" Car Ventilators and "Globe" Lamp Jacks.

Uses of "Globe" Ventilators

Especially adapted for removing excessive heat and foul air from churches, schoolhouses and public buildings; for exhausting steam, smoke and gases from mills, foundries and factories; and for expelling impure air, moisture and odors from barns and stables—in fact, they meet every requirement of ventilators.

Description of "Globe" Ventilators

The "Globe" ventilator is made in all materials, of the proper gages to give lasting service; it is strongly braced with extra heavy steel bands, and is riveted, making an exceptionally strong ventilator, which is efficient under all conditions.

Glass Top "Globe" Ventilators

Glass top ventilators possess all the qualities of the

metal top ventilators, and are designed to secure the greatest degree of ventilation and the largest area of light.

"Globe" Chimney Caps

Prevent downward currents in chimneys and increase drafts in sluggish flues.

Anemometer Readings

Below is given a test made on the "Globe" 24-in. ventilator with 6-in. outlet, under the low wind velocity of less than 5 miles an hour.

RENSSELAER POLYTECHNIC INSTITUTE
Department of Mechanical Engineering
Troy, N. Y.

No. of reading	Velocity of wind in miles per hour	Velocity of air in the ventilator in feet per minute	Temperature difference
1	4.41	468	38°
2	4.65	457	38°
3	4.36	462	38°
4	3.74	447	37°

(Signed) ARTHUR M. GREENE, JR., M. E.



DOME TOP "GLOBE" VENTILATOR



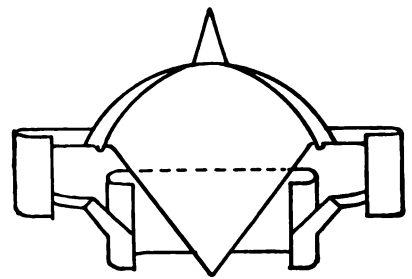
GLASS TOP "GLOBE" VENTILATOR



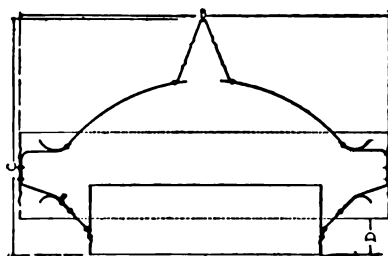
"GLOBE" VENTILATOR, WITH REGULATION SQUARE BASE



SECTIONAL VIEW, DOME TOP "GLOBE" VENTILATOR



DOUBLE DOME GLOBE VENTILATOR
For use over blowers and fans



SECTION

A, diameter of pipe. B, diameter at widest part. C, height. D, distance from bottom of band to bottom of ventilator

PRICES AND DIMENSIONS GLOBE VENTILATORS

Principal dimensions in inches				Gage of iron	Weight of copper, oz.	Area, sq. in.	List price *	Principal dimensions in inches				Gage of iron	Weight of copper, oz.	Area, sq. in.	List price *
A	B	C	D					A	B	C	D				
6	11	9	1 1/2	26	18	29	\$ 3.40	24	43	29	6 1/2	20	20	453	\$ 40.00
8	14	11	1 1/2	24	18	51	4.65	30	50	35	6 1/2	20	24	707	65.00
10	17	12	1 1/2	24	18	79	5.75	36	68	50	8 1/2	18	24	1018	120.00
12	19	13	1 1/2	24	18	113	6.75	40	74	57	8 1/2	18	24	1257	180.00
14	25	17	3	24	18	154	13.00	48	84	64	10	18	28	1810	240.00
16	28	19	3 1/2	22	18	201	20.00	54	92	67	10	18	28	2290	300.00
18	32	22	4	22	18	255	27.00	60	99	70	10	18	28	2828	360.00
20	36	23	4	22	18	314	33.00	72	111	80	12	18	28	4072	480.00

*Subject to liberal discount.

THE OHIO BODY AND BLOWER COMPANY

Rotary Ball Bearing Ventilators

CLEVELAND, OHIO

For Branch Offices, see page 563

Product

ROTARY BALL BEARING VENTILATORS.

For Steam Specialties and Feed Water Heaters, see pages 563-565.



TRADE-MARK
Registered in
U. S. Pat. Off.

Swartwout Rotary Ball Bearing Ventilators

"A hole in the roof is not ventilation." The Swartwout actively compels the flow of air. Because of large ball bearing and ample vane, the Swartwout always faces away from the wind. The free power of the breeze as it passes the mouth of the ventilator creates an active and continual suction which pulls out a steady flow of used air from below.

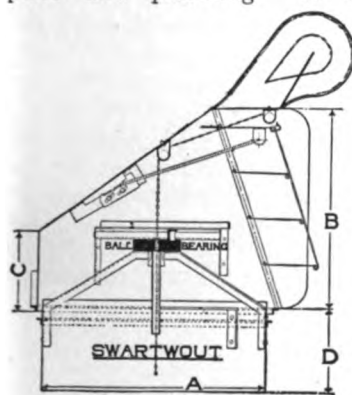
Responding to every change in wind direction, the entire area of the mouth is always efficient. The flow of air, regulated by chain operated dampers, takes only one right angle turn.

The Swartwout ventilator is built of special rust resisting, galvanized metal (or copper on specification), of ample gauge, over a frame-work of sturdy angle iron, galvanized after forming on template and punching. It is

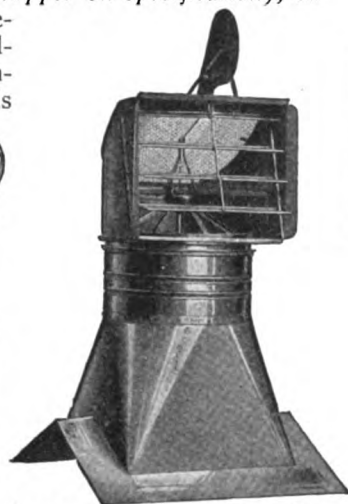
suspended on a skeleton of steel channels and angle iron and revolves on large size noncorrosive, frictionless bronze bearing and hard composition balls, placed centrally in a dust-proof housing.

Skylight Type—When specified, a full size wired glass top may be substituted for the sloping metal top, affording a combination ventilator and self-cleaning skylight. Accurate directions for mounting are supplied on each ventilator.

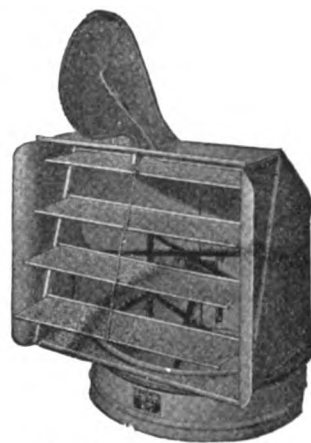
Note the illustrations show that no position of ventilator or damper can obstruct the passage of light into the room below. One view also illustrates the type of base recommended and shows both ventilator and base as built in copper, which is furnished when specified.



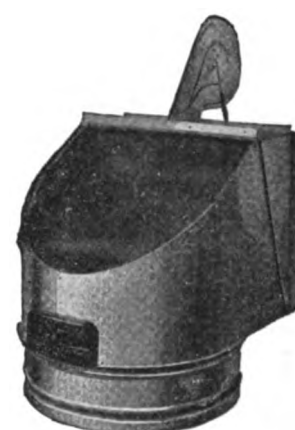
Section
SWARTWOUT ROTARY BALL BEARING VENTILATOR



SWARTWOUT ROTARY BALL BEARING SKYLIGHT TYPE VENTILATOR WITH BASE



FRONT VIEW SHOWING LOUVERS OPEN



BACK VIEW GLASS TOP SKYLIGHT TYPE

Air Requirements—In large buildings, the number of cubic feet of air required for each person in an hour is as follows:

In workshops and barracks, 3000; office rooms, 1800; schools, 2400; hospitals, 3600; churches, theaters, 2000; dining rooms, 1800; toilet and bathrooms, 2400.

Specifications—All ventilators to be of the rotary ball bearing type, glass top [metal top] of galvanized [copper] rust resisting metal, all interior members of angle iron, galvanized after forming and punching. The ventilators to turn sensitively on accurately machined bronze bearings, employing bell metal balls, and counterweighted on outside. The ventilators to be equipped with outside louver dampers to throw accumulated dirt outside of building, louvers to be operated from within by rust-proof chains over brass pulleys. Gauge of metal* to be THE OHIO BODY AND BLOWER COMPANY, Cleveland, Ohio, standard, as furnished in Swartwout rotary ball bearing ventilators at regular prices. Top of collar and bottom of hood to be stiffened with galvanized angle iron rings.

Any or All of Following Features Mailed Free—
Architect's Ventilation Data Card—A quick reference for the drafting room and specification man, printed on heavy card 8½ by 11 in. Contains requirement tables, complete base and ventilator specifications, anemometer test figures, capacity tables, etc. Fits letter size file.

"The Gospel of Fresh Air"—A 24-page handbook giving facts on the fresh air needs of every industry, together with capacity tables and specifications.

"The Guide to Fresh Air"—Concise, definite information with facts and prices.

* (If desired, give standard gauge for each size, as shown in preceding column.)

SWARTWOUT ROTARY BALL BEARING VENTILATOR

A in.	B in.	C in.	D in.	Gauge iron	Weight copper, os.	Weight		Capacity cu. ft. air per min.	Price	Code word
						Net lbs.	Crated lbs.			
10	9½	4	5	24	18	15	25	190	\$25.00	Suleicolle
12	11	4½	5	24	18	20	30	275	25.00	Suleiforme
14	12½	5½	6½	24	18	30	40	370	40.00	Suleipenne
16	14½	6	8½	24	18	40	50	490	50.00	Suleiman
18	16½	6½	9½	24	18	45	65	650	65.00	Sulfacide
20	18½	7½	10½	24	18	50	70	800	75.00	Sulfatable
24	22	9	12½	24	18	85	115	1100	85.00	Sulfatado
30	27½	11½	15½	22	20	120	165	1700	100.00	Sulfatage
36	33	13½	18½	22	24	160	215	2550	150.00	Sulfatamos
42	38½	15½	21½	20	26	225	325	3400	210.00	Sulfataria
48	44	18½	24½	20	26	320	430	4450	240.00	Sulfataron
54	49½	20½	27½	20	28	525	650	5500	350.00	Sulfateur
60	55	22½	30½	20	28	610	735	6850	400.00	Sulfatique
66	60½	24½	33½	20	28	700	825	8250	450.00	Sulfato
72	66	27	36½	20	28	810	960	9850	500.00	Sulfasote

Discounts on request.

Ship by fast freight.....Inceptor Quote lowest price cost and
Ship by express.....Incepting freight
Quote lowest price f.o.b. factory.....Goorkha York City.....Gooseberry

How soon can you ship.....Incarnat
Collars two gauges heavier than top. All ventilators are supplied with chain through ventilator with swivel at end. Additional chain furnished at nominal cost. In ordering, only dimension A is required.

* Figures shown here taken from actual anemometer readings of a ventilator in service under actual conditions (not a laboratory test). The wind velocity was 5 miles per hour, or about one-half average wind velocity of United States, as shown by official government reports. Conditions of test were: Temperature, outside, 30°; inside, 60°. Average wind velocity, 440 ft. per minute, or 5 miles per hour.

KERNCHEN COMPANY

Ventilating Engineers

111 West Washington Street
CHICAGO, ILL.

NEW YORK OFFICE: 1265 Broadway—Telephone, Pennsylvania 2711
AGENCIES IN ALL PRINCIPAL CITIES

FACTORIES
SOUTH GARY, IND.
PHILADELPHIA, PA.
BRANTFORD, ONT., CAN.

Products

"K-S-V's" (KERNCHEN SIPHONAGE VENTILATORS), with or without dampers. Fuse Link Dampers for same when desired.

"K-S-V" (Kernchen Siphonage Ventilator)

For any type of building or enclosure, railway and street cars; chimneys, defective drafts, etc.

"K-S-V" (Kernchen Siphonage Ventilator) does the work of three others. Save this cost.

The correct siphon is the most powerful pulling force known to gravity science. It not only exhausts, it terrifically pulls.

The siphons harness the most delicate air currents, compressing and compelling them to co-act in mightily increasing the upward movement of air through the ventilator, and consequently increasing the pull.

Construction—Simplicity of construction and absence of any mechanism whatever are extra features of the K-S-V (Kernchen Siphonage Ventilator). Free area of outlet over 200% of pipe area. Nothing choking or hindering. Friction at minimum, exhaust at maximum.

The eduction pipe is of cylindrical form throughout. The upper end of the pipe is provided with several V-shaped slits or openings, each opening covered with a siphon, tapered inwardly toward the top and rising above the level of the pipe. A jacket of conical shape envelops these siphons, whereby other siphons are formed, greatly increasing the terrific pulling power of the ventilator. In addition, two hoods are put over the jacket near its mouth, augmenting considerably the pulling force and preventing rain, hail, sleet or snow from going through, thus being absolutely stormproof. There is no band of iron around the two top hoods interfering with the exhaust or outlet area. (See illustration of ventilator.)

The ventilator is in one piece and stationary—no mechanism, nothing revolving or rotating—always silently doing its work. Nothing to wear out. No cost for maintenance. A rotary ventilator requires a certain amount of wind energy to swing it around before it gets ready to ventilate. The "K-S-V" uses this same wind energy to ventilate.



The damper is equally as simple as the ventilator and is made in one piece. It has no sliding sleeves or mechanism.

Caution—Beware of imitations and infringements. Protect yourself by specifying as follows: "K-S-V's (Kernchen Siphonage Ventilators), manufactured by KERNCHEN COMPANY, McCormick Building, Chicago, Ill.," and see that KERNCHEN COMPANY brass tags are on ventilators.

Official Tests

Note in the following two indisputable official tests (which are signed by eminent authorities) the absolute proof of capacity and terrific pulling power. Compare the Case School of Applied Science Official Test (which was made on the roof of a building) with the Armour Institute Official Test (which was conducted in a laboratory), for scientific corroboration and verification of each other, and of our statements regarding the actual powerful pull of "K-S-V's."

We challenge all to furnish such signed, Institutes of Technology Official Tests.

Ventilation of Industrial Buildings

Pivoted sash, sawtooth or monitor roofs, with hinged or pivoted windows, do not ventilate and are useful for light only. Wind pressure, direction, and angle govern window ventilation and produce contrary results. Instead of providing ventilation, they have generally an exactly opposite effect, for the outside air, entering a building through such openings, blows down or back

OFFICIAL TEST OF "K-S-V's" (KERNCHEN SIPHONAGE VENTILATORS) CONDUCTED BY ARMOUR INSTITUTE OF TECHNOLOGY, CHICAGO
SHOWING EXHAUST UNDER DIFFERENT WIND VELOCITIES, AND WHICH SCIENTIFICALLY PROVES THE TERRIFIC PULLING POWER AND 100% TO 300% MORE EFFICIENCY THAN THAT OF OTHER VENTILATORS

Wind velocity, miles per hour	Air pulled through ventilator, lineal ft. per min.	Cubic feet air pulled through ventilator										
		Size of ventilator, in.	12	14	16	18	20	24	30	36	40	48
5	460	Per min.	364.0	492.2	644.0	814.2	1,003	1,444	2,250	3,247	4,000	5,776
		Per hr.	21,840	29,532	38,640	48,852	60,180	86,640	135,000	194,820	240,000	346,560
10	670	Per min.	525.0	717.0	938.0	1,186	1,460	2,103	3,280	4,730	5,830	8,412
		Per hr.	31,500	43,020	56,280	71,160	87,600	126,180	196,800	283,800	349,800	504,720
15	960	Per min.	754.0	1,027	1,344	1,699	2,100	3,014	4,700	6,777	8,350	12,056
		Per hr.	45,240	61,620	80,640	101,940	126,000	180,840	282,000	406,620	501,000	723,360
20	1,220	Per min.	957.0	1,305	1,708	2,159	2,660	3,830	5,980	8,613	10,640	15,320
		Per hr.	57,420	78,300	102,480	129,540	159,600	229,800	358,800	516,780	638,400	919,200
25	1,480	Per min.	1,161	1,584	2,072	2,619	3,230	4,647	7,250	10,448	12,870	18,588
		Per hr.	69,660	95,040	124,320	157,140	193,800	278,820	435,000	626,880	772,200	1,115,280

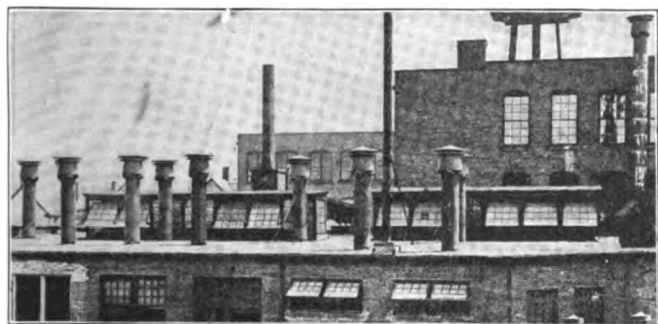
(Signed) G. F. GEBHARDT, A. H. ANDERSON, Mechanical Engineers, Armour Institute of Technology

CASE SCHOOL OF APPLIED SCIENCE—TEST NOV. 6, 1913 ON ROOF OF LEADER BUILDING, CLEVELAND, OHIO

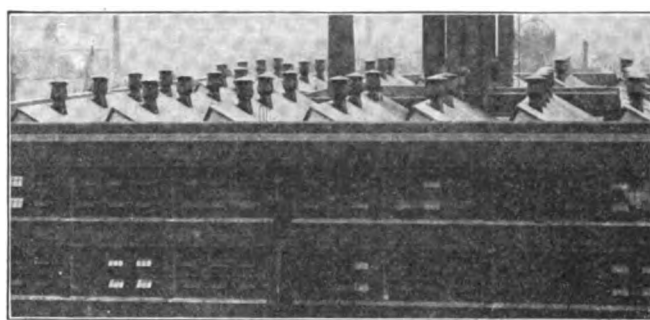
15 inches		Diameter of ventilator		15 inches	
5.32 miles per hour, or 6 3/4 % stronger than Armour's		Velocity of outside wind		5 miles per hour	
497		{ Velocity of air pulled through ventilator per min., lineal ft. }		460	
610		Exhaust of ventilator per min., cubic ft.		564	
Outside temperature, 67° Fahr.		Inside temperature, 85.8° Fahr.			

(Signed) F. H. VOSE,
Head of Mech. Eng. Dept.,
Case School of Applied Science

(Signed) G. F. GEBHARDT,
A. H. ANDERSON,
Mech. Engrs., Armour Institute of Technology



"K-S-V's" INSTALLED ON THIS MONITOR OR LANTERN ROOF WITH PIVOTED SASH



52 "K-S-V's" INSTALLED ON THIS SAWTOOTH ROOF WITH PIVOTED SASH

the foul air, smoke, fumes, etc., which, instead, should be pulled out.

Louvers also have proved to be nothing but complete intakes, driving the foul air, fumes, steam, smoke, etc., down to the floor.

Greater Results with Less Cost

"K-S-V's" (Kernchen Siphonage Ventilators) are far cheaper than other makes since less than half the number or size are required to exhaust the same amount of air. Even then the inferior types, with their larger number or greater size, will not give results equal to the "K-S-V's" (Kernchen Siphonage Ventilators) when the outside air currents are low.

This saving in the number or size of ventilators involves an added saving in installation.

And so, while the initial cost of the "K-S-V" (Kernchen Siphonage Ventilator) may be higher than some others from a diameter standpoint, this is much more than offset by its surpassing exhaust.

entitled "It Pulls," containing complete information concerning the "K-S-V's" (Kernchen Siphonage Ventilators).

Testimonials

The following letters, selected from many received from industrial houses of national and international reputation, convey a limited idea of the way that we and our "K-S-V's" (Kernchen Siphonage Ventilators) are completely curing vexing and costly conditions of foul air, steam, smudge, condensation, moisture, gas, smoke, fumes, dust, etc., giving absolute satisfaction, in many cases after large fans and other types of ventilators have failed to give adequate relief:

AMERICAN CAR AND FOUNDRY CO., CHICAGO—"The Kernchen Siphonage Ventilator has proved very satisfactory. It is installed above our blacksmith shop and it pulls the bad air out."

PACKARD MOTOR CAR CO., DETROIT—"Kernchen Siphonage Ventilators are handling the ventilating of the third floor of our Heat Treat Department and our Truck Blacksmith Shop very well indeed."

THE THOMPSON & NORRIS CO., BROOKVILLE, IND.—"During the months previous to the extreme cold weather, the Kernchen Ventilators absolutely prevented any dripping and condensation in our Machine and Store Room where we were formerly bothered very much, although we had four 36 in. fans and two ordinary ventilators."

"It was such a positive pleasure to go into this room after your ventilators were installed and find the floor and ceiling dry, whereas both used to be covered with moisture, that we wondered if such would be the case when the extreme cold weather set in. The extreme cold weather has been encountered and we have found your ventilators to be just as effective, and our Machine and Store Room has been kept absolutely free from steam, condensation and dripping."

FRAZER PAINT CO., DETROIT—"The summer of 1916 will pass into weather history on account of the long, torrid spell in the Middle West. Factories and furnaces were forced to suspend operations on account of the heat or materially curtail productions."

"Detroit was no exception as a sufferer from the heat and our factory of metal sash construction became so hot that the men

could not stand it and we were confronted with a shutdown at the time of the greatest rush of business in our experience."

"But instead, we installed K-S-V's (Kernchen Siphonage Ventilators) according to the layout proposed by your man, and they saved the day for us."

"Not only did they cause a refreshing current of air by withdrawing the hot, bad air, but they reduced the temperature of the working rooms several degrees. We did not shut down, but, instead, had an output beyond the usual."

"When our factory was built in 1915, we had intended to install K-S-V's, but the architect provided others and the contract had been let before we noticed it and we did not insist. Under stress, they proved entirely inadequate."

"We regard the K-S-V in a class by itself."

KERNCHEN SIPHONAGE VENTILATOR DATA

Size, in.	Area, sq. in.	Exhaust per hour cu. ft., 10-mile wind velocity	Approximate shipping wt., lbs.	Gage	Price, Galvanized,		Price, Ingot Iron, Toncan, Keystone or equivalent		Price, Copper					
					Dampers	Ventilators	Dampers	Ventilators	Light			Medium		
									Wt. ozs.	Dampers	Ventilators	Wt. ozs.	Dampers	Ventilators
6	28	7878	10	26	\$2.55	\$10.67	\$2.81	\$11.74	12	\$3.08	\$14.39	16	\$3.23	\$16.56
8	50	14070	16	26	3.14	12.98	3.45	14.28	12	3.20	19.96	16	3.36	22.14
10	78	21900	20	24	3.89	17.16	4.28	18.88	14	4.84	24.66	18	5.08	26.85
12	113	31500	28	24	4.67	18.04	5.15	19.84	14	5.79	30.91	18	6.07	33.30
14	154	43020	47	24	5.35	21.56	5.89	23.72	16	6.49	44.40	20	6.81	48.54
16	201	56280	58	24	5.92	25.08	6.51	27.59	16	7.24	53.42	20	7.61	58.61
18	255	71160	82	24	6.46	28.60	7.11	31.46	16	8.97	62.60	20	9.42	69.23
20	314	87600	108	22	7.51	36.08	8.26	39.69	16	10.19	69.22	20	10.70	76.50
22	380	106080	123	22	8.15	42.68	8.96	46.95	16	10.85	92.16	20	11.22	96.54
24	453	126180	155	22	9.17	47.96	10.09	52.76	16	12.55	99.07	20	13.18	109.48
26	521	148740	190	22	10.35	60.72	11.39	66.79	18	14.25	122.44	22	14.85	146.95
28	615	171600	221	22	10.58	68.64	11.64	75.50	18	15.35	149.48	22	16.12	167.81
30	707	196800	270	20	12.82	74.36	14.10	81.80	20	17.94	171.71	24	18.84	192.96
32	1017	283800	450	20	14.90	101.20	16.39	111.32	20	20.62	254.23	24	21.64	286.79
42	1385	349800	580	20	18.07	154.00	19.88	169.40	20	25.62	354.97	24	26.87	397.60
48	1810	504720	785	20	22.42	228.80	24.66	251.68	24	32.13	652.89	28	34.05	644.30
54	2290	648200	990	20	26.77	290.40	29.45	319.44	32	41.67	688.77	36	45.84	757.65
60	2827	787800	1025	18-20	32.04	429.00	35.24	471.90	36	48.63	1050.06	40	53.49	1155.07
66	3421	1072740	1175	18-20	37.85	572.00	41.64	629.20	36	68.07	1315.65	40	74.88	1447.22
72	4072	1133640	1600	16-18	43.35	729.00	47.69	834.90	40	72.24	1682.28	48	79.46	1850.51
84	5542	1567800	2500	14-16	59.15	1237.50	65.07	1361.25	42	91.68	2454.30	48	100.85	2699.73

These prices do not include bases, condensation arresters, fusible fire links or damper chain. Prompt shipment from stock from our factories at South Gary, Ind., and Philadelphia, Pa.

Special Ventilation Service

The KERNCHEN COMPANY specializes in ventilation and its engineers are always available, gratis.

Particular attention given to difficult or unusual problems involving great heat as well as temperatures below the freezing point; steam conditions; elimination of condensation, moisture, fumes, gases or smudge, foul or vitiated air, in every type of building or room.

Booklet—"It Pulls"

A postal will bring our latest illustrated booklet,

ROYAL VENTILATOR COMPANY

417 Locust Street
PHILADELPHIA, PA.

Products

Manufacturers of "ROYAL" VENTILATORS of Galvanized Steel, Pure Iron, Copper, etc.

Glass Top Ventilators; Rectangular and Square Ventilators with fire retarding dampers; Smoke Jack and Combination Ventilators; Insectproof and Bird-proof Ventilators.

Double Cone Ventilators

The double cone is designed to withdraw smoke, fumes, and impure air without any resistance being offered to the outward flow. The lower cone is placed directly in the center of ascending air, which, upon striking it, is deflected directly upward and outward. There are no obstructions. Only an upward draft is obtained. The "Royal" ventilates continuously, regardless of wind or temperature conditions. The tapered frustums force outside air currents over top and down sides, providing a constant strong upward draft.

Construction

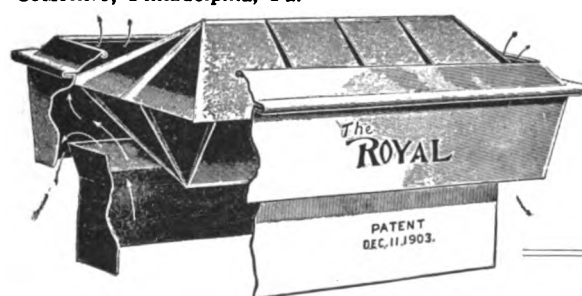
If the construction of the "Royal" ventilator is examined critically, the "Royal" will be specified.

The double cone has two thicknesses of metal, doubling the life of the ventilator. Every known mechanical improvement is embodied in the "Royal"; all sections are built with lapped seams, giving three thicknesses of metal at joints; all edges are wired for rigidity and weather resistance; all bracing is accomplished with galvanized iron stays, so arranged as not to impede passage of air. Absolutely weatherproof.

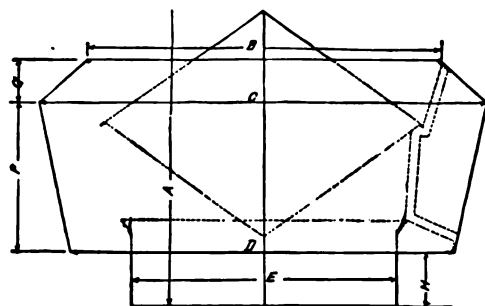
The "Royal" is especially adapted for foundries and chemical plants.

Specification

"Furnish and erect Royal Double Cone [Glass Top] Ventilators, manufactured by ROYAL VENTILATOR COMPANY, Philadelphia, Pa."

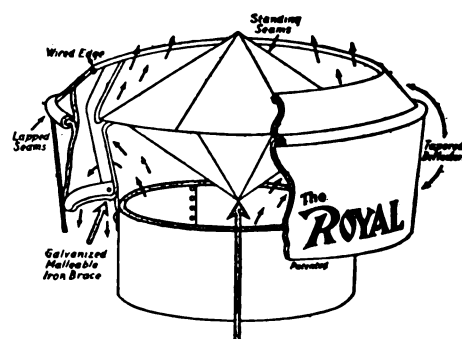


RECTANGULAR "ROYAL" VENTILATOR
Metal or glass top. Made to any size



SECTIONAL DRAWING "ROYAL" DOUBLE CONE VENTILATOR

Send for catalogue and model

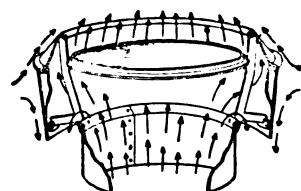


The Inverted Cone.
The reason the Royal exhausts more air per minute - also why it offers least resistance to natural or forced draft.

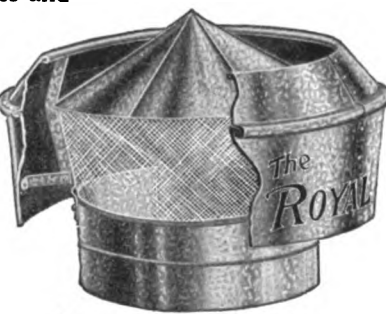
DOUBLE CONE VENTILATOR, ILLUSTRATING THE "ROYAL" PRINCIPLE—100% EFFICIENT



BASES MADE TO FIT ANY
TYPE OF ROOF



"ROYAL" GLASS TOP VENTILATOR
Gives more light and ventilation



INSECTPROOF VENTILATOR

For hospitals, barns, powder mills, etc.



"ROYAL" VENTILATOR
With fire damper

"ROYAL" DOUBLE CONE VENTILATOR DATA

Size, in.	Dimensions, in.								Area, sq. in.	Gage of iron	Weight of copper, oz.	List price	Cu. ft. exhaust per minute, wind 7 miles per hour
	A	B	C	D	E	F	G	H					
10	12	13	16	14	10	5	2	3	78	24	16	\$ 5.75	141
12	13	15	19	16	12	6	2	3	113	24	16	6.75	159
16	17	20	26	23	16	8	3	3	201	24	16	20.00	388
18	18	23	29	26	18	8	3	3	255	24	16	27.00	490
20	21	25	31	28	20	10	4	5	314	24	16	33.00	606
22	24	26	34	32	22	11	4	5	380	24	16	36.00	729
24	24	30	39	34	24	11	5	5	453	22	16	40.00	874
26	24	33	42	36	26	13	4	3	527	22	16	50.00	1005
28	26	35	45	40	28	13	5	3	615	20	16	56.00	1186
30	26	35	45	41	30	14	5	4	707	20	18	65.00	1364
32	25	37	47	44	32	14	5	4	804	20	18	80.00	1551
34	28	40	50	48	34	15	5	4	908	20	18	100.00	1765
36	28	44	56	51	36	15	6	4	1017	20	18	120.00	1961
40	34	47	61	55	40	16	7	5	1257	18 and 20	18	180.00	2424
42	32	52	68	63	42	17	7	3	1386	18 and 20	18	190.00	2673
44	35	54	70	64	44	18	7	5	1620	18 and 20	18	200.00	3124
48	39	59	75	70	48	19	8	4	1809	18 and 20	20	240.00	3489
54	42	68	84	77	54	22	9	4	2390	18 and 20	20	300.00	5414
60	47	76	94	82	60	23	8	8	2807	18	24	360.00	6665
66	52	81	103	94	66	26	9	6	3504	18	24	420.00	7851
72	50	86	108	98	72	26	10	6	4071	18	24	480.00	10682

SI-FO VENTILATING EQUIPMENT CO.

Kirby Building
CLEVELAND, OHIO

Product

SI-FO VENTILATOR.

Description

The Si-Fo ventilator is of the rotary type, with the siphonic feature perfected and embodied in the design and construction which gives it power to eject more air than any other ventilator made.

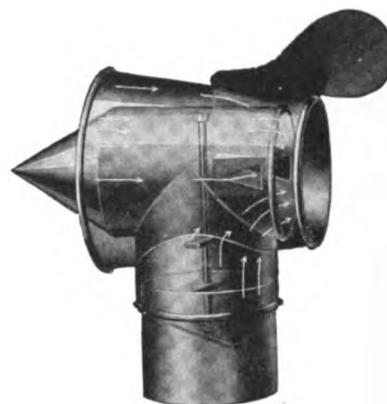
It is constructed in a neat and durable manner, of sufficiently strong material and bracing to withstand long and continuous operation. It is made of rust resisting galvanized sheet metal or cold rolled copper. The revolving part of the ventilator is supported by a phosphor bronze bearing resting on a steel shaft. It is practically noiseless in operation and is guaranteed to operate at all times and under all conditions. Also made of lead or zinc to conform with roof material.

Operation

As the wind strikes the cylindrical cone it is deflected outwardly to the larger or front end of the funnel. As the funnel tapers around the inner chamber, the outlet is contracted, which causes the air to leave at a greater velocity than that at which it entered. This produces siphonic action at the open end of the inner chamber and naturally exhausts air from the vertical chamber.

To further increase the velocity of the air for obtaining greater siphonic action, a plurality of openings is provided in the walls of the inner chamber. These openings are covered by inclined pockets having open front ends and closed rear ends.

As the air enters these pockets it is directed through the openings into the inner chamber near the open end, and this produces increased velocity of the air at the discharge end of the inner chamber. The cylindrical form of this ventilator precludes the possibility of dead air pockets, which exist in the square or rectangular design of ventilators.



SI-FO VENTILATOR

Test

F. H. Vose, Professor of Mechanical Engineering, Case School of Applied Science, Cleveland, Ohio, conducted an authoritative test of the Si-Fo ventilator, using the standard 12-in. size. The ventilator was installed on the roof of a factory in the typical manner and the test was taken during working hours. A summary of the test showed:

Average outside wind velocity.....376 ft. per minute
Average velocity of air through
intake of ventilator.....592.5 ft. per minute
Percentage of excess of intake velocity
over outside wind velocity......63%

At the same wind velocity, the Si-Fo ventilator has a greater velocity through the ventilator and moves more cubic feet of air per minute per square inch of area opening, than any other ventilator on the market.

CUBIC FEET PER MINUTE BASED ON WIND VELOCITY OF
5 MILES PER HOUR

Diameter, in.	Weight, lbs.	Cu. ft. per minute capacity	Diameter, in.	Weight, lbs.	Cu. ft. per minute capacity
8	18	240	20	96	1530
10	24	375	24	160	2200
12	32	540	30	205	3410
14	40	745	36	280	4950
16	52	975	42	395	6720
18	68	1230	48	560	8750

Special Construction

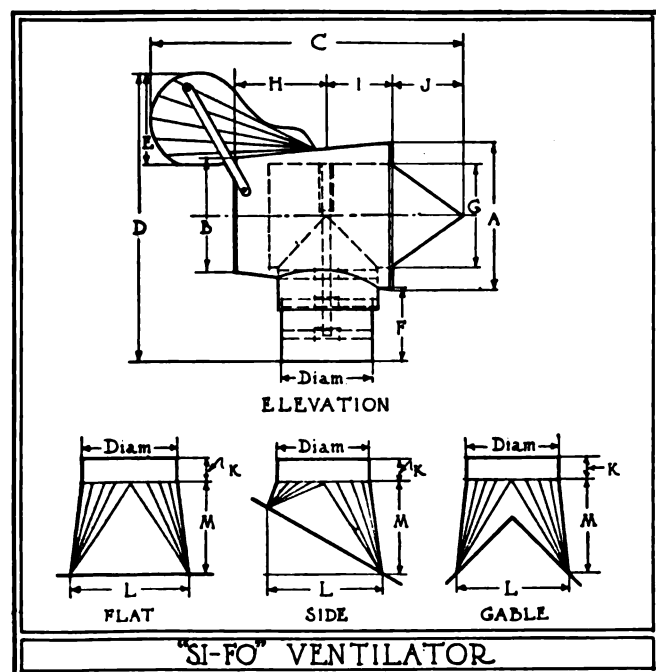
For acid conditions we are now prepared to furnish ventilators made entirely of monel metal, hard lead with machined parts of monel metal and ventilators coated with special acid resisting solutions.

Bulletins

Bulletins covering details of design and construction sent on request. Write for information as to special applications, erection and other details you may desire.

Patents

The Si-Fo ventilator is fully protected by United States patents.



DIMENSIONS IN INCHES

Diam.	A	B	C	D	E	F	G	H	I	J	K	L	M
8	12	9 1/2	27 1/2	19 5/8	8	6	9	8	5 1/2	6 3/4	10	8	
10	15	11 1/2	34 1/2	23 3/8	10	8	11	10	6 3/4	8 3/4	12	10	
12	18	14	40 1/2	29	12	8	13	12	8	10	14	12	
14	21	16 1/2	46 1/2	33	14	8	15	14	9 3/4	11 1/2	16	14	
16	24	18 1/2	53 1/2	38 1/2	16	10	17	16	10 3/4	13 1/2	18	16	
18	27	21	60 1/2	42 3/4	18	10	19	18	12	15	20	18	
20	30	23 1/2	66 1/2	47	20	12	21 1/2	20	13 1/4	16 1/2	24	20	
24	36	28	80	57	24	14	25 1/2	24	16	20	28	24	
30	45	35	99 1/2	70	30	16	32	30	20	25	34	24	
36	54	42	119	84 1/2	36	18	38	36	24	30	40	27	
42	63	49	140	97 1/2	42	20	44	42	28	36	46	31 1/2	
48	72	56	161	111 1/2	48	24	50	48	32	42	52	36	

THE STARK SHEET METAL WORKS COMPANY

Roof Ventilators
418 Second Street, S. E.
CANTON, OHIO

Products

MACK EJECTOR-VENTILATOR.

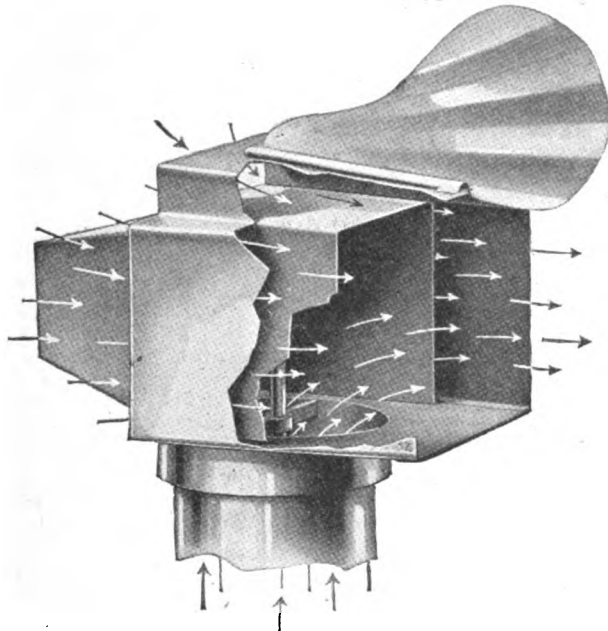
AIR-O-MATIC VENTILATOR.

For Heat Regulating Devices, see page 290.

Mack Ejector-Ventilator (Patented 1919)

It is readily admitted that nearly all ventilators are weatherproof and it is also common knowledge that all of them ventilate with varied efficiency under favorable conditions, but the requirements of a ventilator do not cease here. The ventilator to be desired is one that will operate in a low wind as well as in a high wind, one that has ease of motion so that down-draft is eliminated and, lastly, one that has proved its dependability in actual practice.

The Mack Ejector is of recent origin, thus we have been enabled to embody in it all the principles of good ventilation that modern science can suggest.



MACK EJECTOR-VENTILATOR
Showing direction of air currents

AIR CHANGES PER HOUR WITH THE MACK EJECTOR-VENTILATOR

For ventilating workshops and factories.....	2 to 3
To prevent sweating in closed rooms.....	3 to 5
Comparatively crowded buildings, such as restaurants, schools, hospitals, theaters, etc.....	5 to 10
For removing of light fumes, smoke, odors, etc.....	8 to 10
For drying leather, paint, etc.....	10
Highly heated rooms up to 100° Fahr.....	10 to 12
For removing steam or heavy fumes.....	15 to 20
For removing light dust.....	20
Highly heated rooms up to 120° Fahr.....	20 to 30

Do not place ventilators more than 30 ft. apart; average distance, 20 ft.

WEIGHTS AND SIZES, MACK EJECTOR-VENTILATOR

Size No.....	4	6	8	10	12	14
Gauge steel.....	26	26	24	24	24	24
Weight, lbs.....	15	18	20	35	45	65
Displacement, cu. ft. per hour.....	4,300	9,600	17,000	26,600	38,400	52,200

Size No.....	16	18	20	24	30	36
Gauge steel.....	22	22	22	22	20	20
Weight, lbs.....	85	120	135	185	265	450
Displacement, cu. ft. per hour.....	68,200	86,300	106,500	153,400	230,000	278,000

SWEET'S CATALOGUE

Operation—The wedge is always headed into the wind due to the practically frictionless bearing. This prevents back pressure or down-draft. The wedge deflects the current into three perfect ejectors which cover the head. These ejectors, decreasing in size toward the discharge ends, act as air compressors so that the current is accelerated in passing through and discharged at high velocity. This means the utilization of low velocity wind pressure. This powerful and constant ejector discharge generates a continuous partial vacuum in the head, causing a strong suction in the stack. Heavy gases and cold air are easily lifted regardless of weather or climate.

Bearing—The bronze cone bearing, working in a female part, may be likened to a top, operating with comparatively the same ease and as silently. Furthermore each ventilator is properly balanced, thus reducing friction to a minimum. Repairs and other attention are practically nil.

Installations and Testimonials—Mack Ejector-Ventilators have been on the market six years and thousands are in use. Far from being an experimental idea, they have by actual service proved their merit for many of the country's largest industrial concerns, such as:

The B. F. Goodrich Rubber Co.

International Harvester Co.

Firestone Tire & Rubber Co.

National Screw & Tack Co.

Willard Storage Battery Co.

Dodge Bros.

Standard Oil Co.

The Barrett Co.

Diamond Match Co.

Also various schools, hotels and public buildings.

Numerous testimonials have been received and are in our files. An example is the following from the National Screw & Tack Co.:

"Our nickel plating department caused us considerable trouble. The fumes passed through into other departments, causing the bright bolts which were in process to become badly coated with rust.

"Since your installation of these ventilators all of our trouble has been avoided, the air in this room being perfectly pure at all times. Not only we ourselves, but the men working in this department, praise your ventilators every day."

Air-o-matic Ventilator

This ventilator is of the stationary type and constructed along lines that are scientifically correct in every respect.

Regardless of the direction of the wind (straight across, up or down) this ventilator will perform at maximum efficiency without danger of down-draft. This in itself is an accomplishment, the secret of which lies in the fact that our first consideration has been the unobstructed passage of air.

The special double cone safeguards against inclement weather and down-draft without needlessly sacrificing free air capacity. The lower part of the body is open so that rain driving in at the top will strike the lower cone and fall harmlessly on the roof.

Made in two sections—easy to paint and erect.



AIR-O-MATIC
VENTILATOR

THE AEROSHADE COMPANY

Ventilating Window Shades

2293 Oakland Avenue
WAUKESHA, WIS.

Product

AEROLUX VENTILATING SHADES for factories, offices, stores, schools and public buildings.

AEROLUX
VENTILATING
WINDOW SHADES
TRADE-MARK

than appears on the surface, and our specialists, with several years of industrial shading experience, are ready to assist in solving problems.

In writing for further information, drawings or blue prints showing complete

details of sash and wall openings, should be sent.

Construction

All Aerolux shades are constructed from a splint fabric composed of tough, heat resisting linwood splints which are woven together with a hard twist seine twine.

The shades are adjusted by means of cords and special stop pulleys—no spring rollers are used. All necessary fixtures for installation are included.

Types of Factory and Office Shades

For factory use, the three types of shades most commonly employed are those illustrated.

Single Type with Regular Hangings—Equipped to hang at the top and roll up from the bottom. May be used wherever the shades hang far enough away from the windows to clear open ventilators without interfering with workmen or machines.

Single Type with Top Drop—Especially adapted to very wide rooms. Protection against the sun's heat and glare is provided for the workers close to the windows without cutting off the light farther back in the room.

Besides dropping from the top, the shades will roll up from the bottom so that any desired lighting effect is obtained. When not in use they may be rolled entirely to the top.

Duplex Type—A type to use where open ventilators extend inside of wall line and where shades must occupy a minimum of room space. Upper section clears ventilator but does not interfere with workers or machines.

The two sections operating independently permit any desired lighting effect.

Sizes

Shades may be made in any width up to 20 ft. and in any desired length. Because of the great variety of sash types and sizes, and also bay construction, shades are made to order only.

Advantages of Aerolux Ventilating Shades

Exclude the sun's direct rays.

Admit a good working light.

Diminish glass intensified heat.

Permit ventilation even when the shades entirely cover the windows.

Are durably constructed to withstand many years of hard industrial usage with no expensive upkeep or replacements.

Answer the purpose of both awning and shade and since they are used inside are not subject to destructive effects of wind and weather.

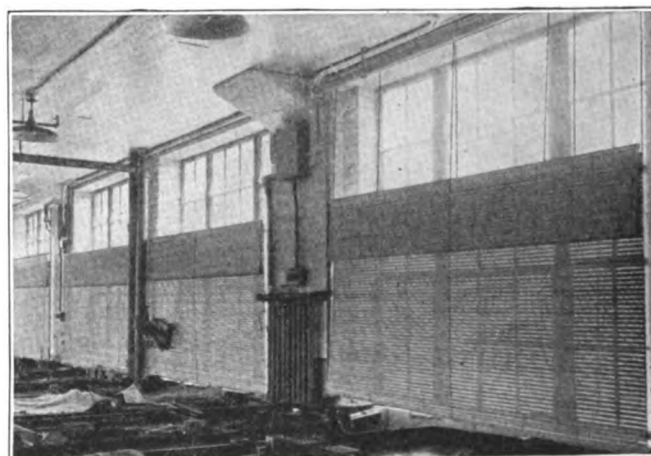
Are equipped with simple fixtures which are durable, positive in action and foolproof.

Co-operative Service

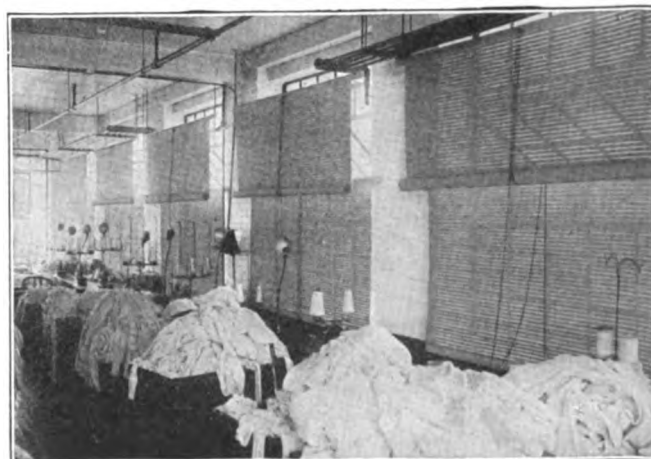
Efficient window shading is often more complex



Single Type with Regular Hangings



Single Type with Top Drop



Duplex Type
AEROLUX VENTILATING WINDOW SHADES

HOUGH SHADE CORPORATION

Steel Sash Ventilating Window Shades

JANESVILLE, WIS.

Product

RA-TOX VENTILATING WOOD STRIP SHADES, for factories, offices, schools and hospitals.

RA-TOX

TRADE-MARK

Introduction

Center swing steel sash no longer are an obstacle to proper shading. RA-TOX shades are applied direct to steel sash. No expensive or troublesome boring of concrete or brick walls.

Construction

RA-TOX ventilating window shades are made of wood strips stained with permanent colors and woven together with hard-twisted seine twine and finished at top and bottom with double strength moulding.

Function

Various forms of shading have been devised since the advent of steel sash. Most of them defeat the original purpose of the sash, which is to *allow as much daylight as possible* to enter the shaded area. While RA-TOX shades eliminate the heat and glare from the sun's rays, they allow 25% to 40% more light to enter than any other form of shading.

Sizes

RA-TOX shades may be had in all widths up to 12 ft. and in any drop desired. Single-piece shades wider than 12 ft. are impracticable and not recommended.

Ra-tox Equipment

Ra-tox Shades for Steel Sash—Utilize brackets attached to the steel ribs. This patented equipment—the only thing of the kind made—makes

it practical to install RA-TOX shades on tilting section steel sash directly to the sash itself in such a way that the shades do not interfere with the ventilator, whether it is open or closed, and at the

same time the light in the room can be regulated as desired. The shade is automatically brought in flush against the wall at the base of the sash, out of the way of both workers and machinery (Fig. 3).

Light Over the Shade—Where it is necessary to shade wide rooms, the RA-TOX "Drop from the Top" equipment is recommended, as it makes it possible to lower the entire shade from the top to any

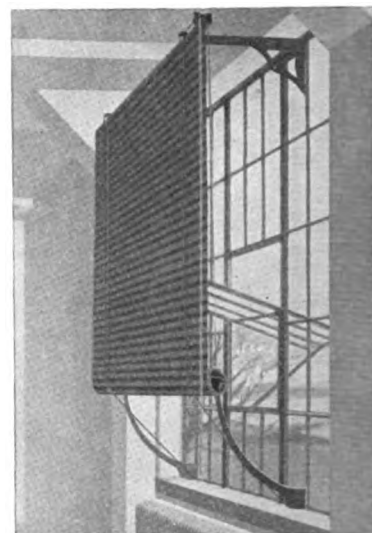


FIG. 3. SHADES FOR TILTING STEEL SASH



FIG. 1. INSTALLATION OF SHADES FOR SLIDING WOOD SASH

point of the window desired (Fig. 2). Workers near the window are thus protected from the glare and heat of the sun without cutting off the light from points further back in the room.

Ra-tox Shades for Sliding Wood Sash—Suspended either inside the wood trim or from the face of the wood trim, as desired (Fig 1).

Ra-tox Reasons Why

Eliminates the Heat and Glare From the Sun's Rays—Produces a soft, mellow, even-tempered working light.

Indestructible—Constructed of wood strips and seine twine. RA-TOX shades are practically indestructible. No replacements are necessary.

Aid Ventilation—With RA-TOX shades and equipment, all the ventilators in the steel sash can be opened without interfering with the function of the shades. This is of immense importance.

Non-conductors of Heat—Constructed of stained (not painted) wood strips, RA-TOX shades keep down the temperature of room by their insulating effect in excluding heat of sun intensified through the glass.

Simplicity of Construction—The RA-TOX cord grip (a patented feature) holds the shade at any point desired. It is positive in action and guaranteed against any and all defects.

Estimates

On receipt of plans, blue prints or a statement of the requirements, we will cheerfully give an estimate of the entire cost of the installation.

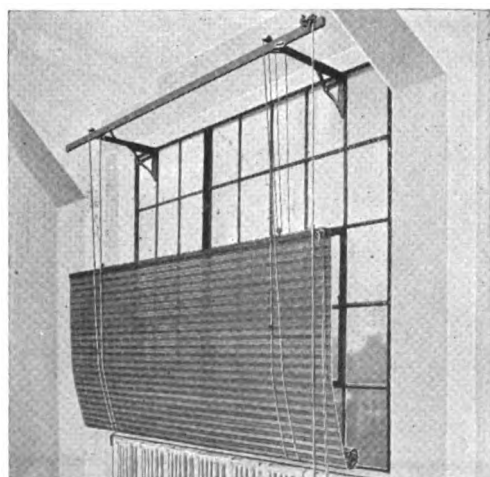


FIG. 2. SHADE WITH DROP-FROM-THE-TOP FEATURE

BANCROFT-JONES CORPORATION

Steel Structures

GENERAL OFFICE AND WORKS
BUFFALO, N. Y.

BRANCH OFFICES

BOSTON, MASS.

BALTIMORE, MD.

DETROIT, MICH.

PHILADELPHIA, PA.

Products

STANDARDIZED and SPECIAL STEEL BUILDINGS.

Specifications of Standardized Bancroft Buildings

Dimensions—Buildings may be any length. (For widths see dimension drawings below.) There are 3 standard heights, measuring 10 ft., 15 ft. and 20 ft. from curb to eave. Special heights fabricated to order.

Monitors—Continuous or intermittent monitor can be provided, 8 ft. 6 in. or 17 ft. 6 in. wide, 2 ft. 6 in. or 6 ft. high fitted with ventilating or fixed steel sash.

Frame—The steel framework of Bancroft buildings is constructed of standard rolled structural shapes, with no plates or angles less than ¼-in. thickness, fabricated and shop riveted into the largest possible standard units convenient for shipment and erection. These units are carefully painted with a high grade structural steel paint. The steel framework is



TRADE-MARK

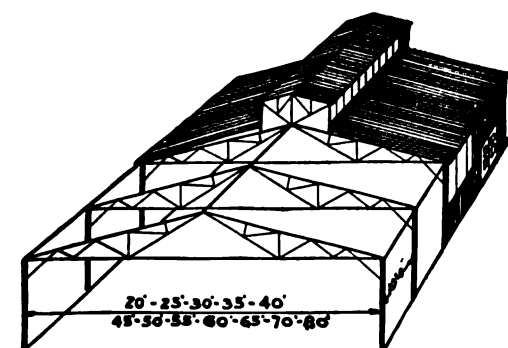
designed as an independent unit and to meet the rigid requirements of city building codes. The trusses are Fink type, one-fifth pitch; the purlins are rolled structural channels.

Covering—Because of its permanence without paint, insulating and weather resisting value we have adopted asbestos protected corrugated metal for the covering of the buildings illustrated.

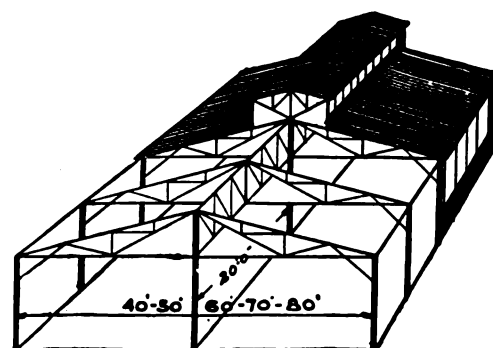
Asbestos protected metal, a combination of No. 24-gage solid sheet steel, asphalt, asbestos felt and waterproofing is rustproof and corrosionproof, does not require painting, and is used extensively by many large industrial corporations. Any corrugated roofing or siding material can be used however: plain painted steel, galvanized or zinc sheets. Hollow tile, brick or metal lath with stucco may be used for sidewalls.

Windows—Solid steel factory sash, ventilating or fixed type, 2-unit sizes, arranged to give any amount of light desired.

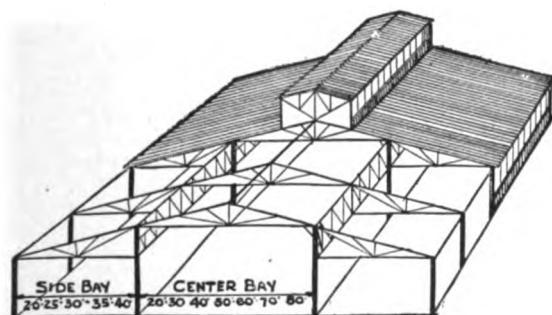
Doors—Sliding or swinging; three standard sizes, 3 ft. x 7 ft. 8 in., 5 ft. x 7 ft. 8 in., 9 ft. 6 in. x 10 ft. Special sizes to order.



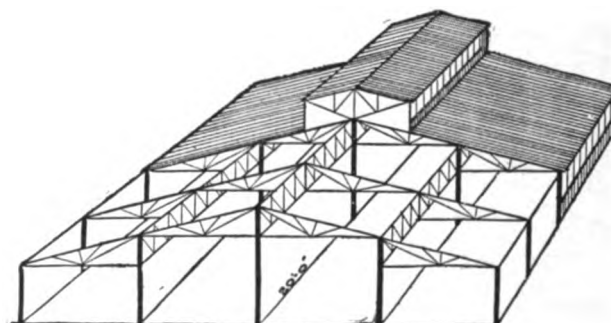
Type A



Type B

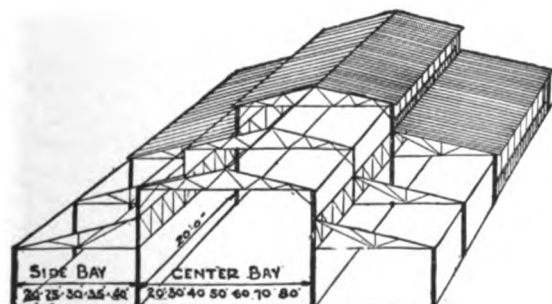


Type C

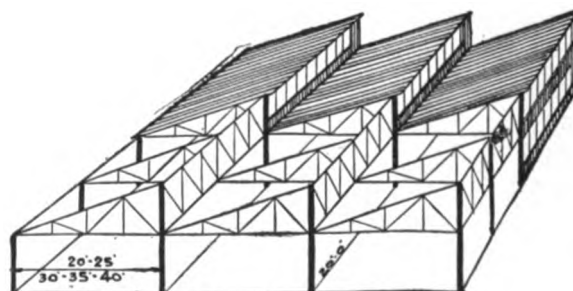


Type D

Width, from 80 to 160 ft., in multiples of 10 ft.



Type E



Type S

DIMENSION DRAWING—TYPES OF STANDARDIZED BANCROFT INDUSTRIAL STEEL BUILDINGS

THE HYDRAULIC STEELCRAFT CO.

OF THE HYDRAULIC STEEL COMPANY

Standardized Steel Buildings, Steel Forms and Column Guards

TELEPHONE
BROADWAY 2480

CLEVELAND, OHIO

CABLE ADDRESS
"HYDRAULIC"

BRANCH SALES OFFICES FOR STEEL BUILDINGS

*NEW YORK, N. Y.
*CHICAGO, ILL.
*ST. LOUIS, MO.
*DETROIT, MICH.
BOSTON, MASS.
MEMPHIS, TENN.
COLUMBUS, OHIO

CINCINNATI, OHIO
NORFOLK, VA.
ROANOKE, VA.
OMAHA, NEBR.
WICHITA, KANS.
*HOUSTON, TEX.
MILWAUKEE, WIS.

SYRACUSE, N. Y.
PITTSBURGH, PA.
NEW ORLEANS, LA.
*RICHMOND, VA.
PHILADELPHIA, PA.
LANSING, MICH.
LOUISVILLE, KY.

ROCHESTER, N. Y.
DALLAS, TEX.
CHARLESTON, S. C.
CHARLESTON, W. VA.
CHATTANOOGA, TENN.
KNOXVILLE, TENN.
KANSAS CITY, MO.

OKLAHOMA CITY, OKLA.

Products

STANDARDIZED STEEL BUILDINGS;
WALL, COLUMN, SEWER and TUNNEL
FORMS.

Also manufacturers of Column Guards.

Hydraulic Steel Buildings

Hydraulic steel buildings are used for warehouses, factories, machinshops, foundries, commercial garages, pump houses, bunk houses, shop restaurants, oil refineries, transformer sheds, storage buildings, dairy houses, farm buildings, machinery sheds and garages. They are strong, weathertight, fireproof structures. They are so constructed of interchangeable steel panels that they can be quickly erected in any locality with few tools and by unskilled labor. They are permanent, yet portable, since they can be rapidly disassembled, moved and re-erected without deterioration of the buildings.

The studied design combined with skillful fabrication assure not only sound construction but attractive appearance as well. Hydraulic steel buildings come in widths shown in cross-sectional sketches and in lengths any multiple of the 30-in. panel width.



TRADE-MARK

Construction—Standard Hydraulic steel buildings consist of two essentials: a self-supporting framework and a covering of heavy gauge pressed sheets of special rust resisting "Hy-Cop" steel.

The buildings are made entirely of cold rolled shapes, rolled with strip steel in our own plant, and are designed in accordance with the best engineering practice and carry a factor of safety of 4, the only deviation from cold rolling being on high walls and large spans, in which case hot rolled shapes are used in place of the cold rolled.

In various types of buildings the exterior columns are spaced 10 ft. on center while the interior columns are spaced either 10 or 20 ft. on center.

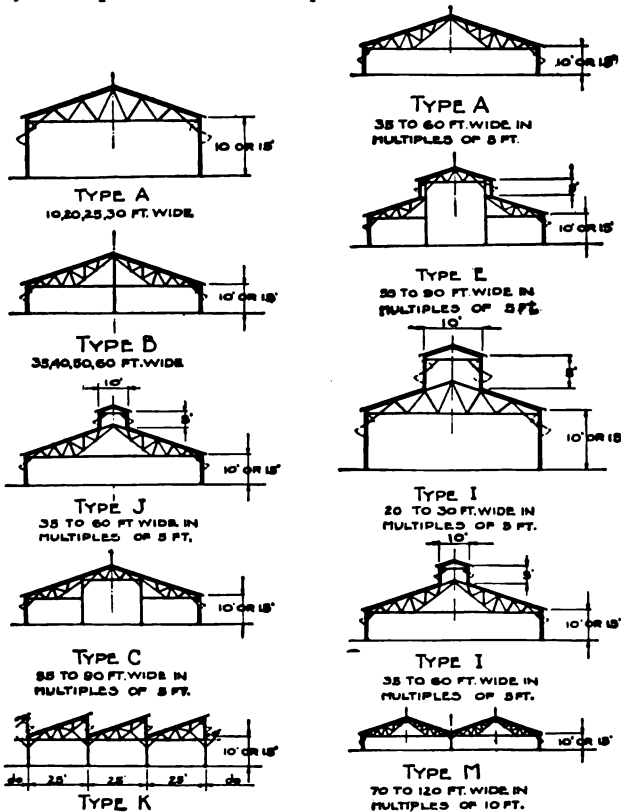
The wall covering consists of heavy gauge stamped paneled sheets 30 in. wide, fastened to each other and to the columns by means of wedges and keys. They are weatherproofed by a separate sealing strip at each joint.

The roof consists of flat "Hy-Cop" sheets interlocking top and bottom and supported at the upper edge by a Z-bar purlin which is spot-welded to the sheet and in turn bolted directly to the top chords of the trusses.

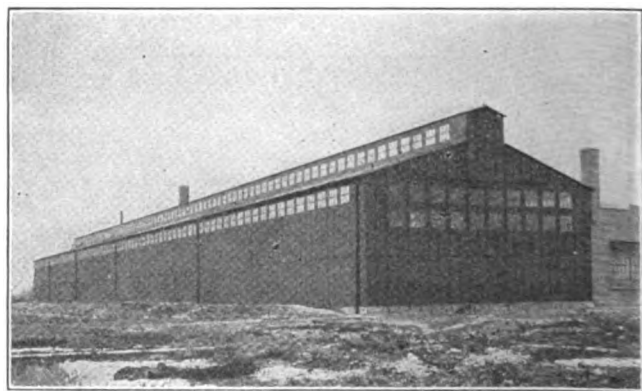
The junction of the ends of the roof sheet is made tight by means of a cover strip bolted in place. The structural work is all riveted in the shop and it is sent to the field in convenient units ready for a bolt assembly.

The wall panels are crated for shipment so that there is no chance of damage to these pieces.

Sash is supplied in either six- or nine-light fixed or ventilating type, the sash assembly being made up so that it will interchange with standard sheet 5 ft. long.



STANDARD BUILDING SECTIONS



HYDRAULIC STEEL BUILDING, 400 FT. LONG, 60 FT. WIDE AND 25 FT. HIGH TO THE EAVES

Built for the Wood Hydraulic Hoist & Body Co., Detroit, Mich.

*Offices which also handle forms and column guards.

Doors are supplied as 10x10 ft. double sliding and 3x7 ft. hinged. Doors are made of a continuous angle frame, properly reinforced and covered with No. 20 gauge sheets.

Note: Special buildings can readily be furnished with corrugated roof and wall sheets. The units of any building can be furnished separately, such as trusses, columns, purlins, roof and wall sheets.

Hydraulic Steel Forms

Hydraulic steel forms are made of open hearth steel formed in large hydraulic presses.

These pressed steel shapes have two great advantages. First, the metal is placed where it is required to develop the full power of the section. Therefore, pressed steel forms are much lighter for the same strength or much stronger for the same weight compared to standard rolled steel sections. Second, the sections when pressed in the large hydraulic presses are accurately made. A variation of ten thousandths of an inch is all that is allowed. Therefore, Hydraulic pressed steel forms are interchangeable and universal in application.

Wall Forms—The wall and foundation forms consist of uprights which are aligned and accurately spaced 3 ft. 3 in. center to center by pressed steel liners. Between these uprights are clamped steel faced plates. Any plate can thus be placed or removed at any time without disturbing any other plate.

This framework of uprights which is erected and aligned before setting the plates allows the reinforcing to be set before the forms are completely erected, insuring proper placing of steel. This framework also allows brackets to be used for scaffolding which are easily attached and detached to holes in uprights.

Hydraulic steel wall forms are light, rigid and strong. Three men can easily and quickly erect or take down all parts of these forms. Where overhead cranes or cableways are used, forms can be fastened together so as to make larger units.

Column Forms—Hydraulic steel column forms consist of two principal parts: the capital and the shaft. The capital is made of several parts, depending on its size and the diameter of the column shaft. These parts are the head, head extensions and the column extension. Standard capitals are cone shaped and have a 1 to 1 or 45° slope.

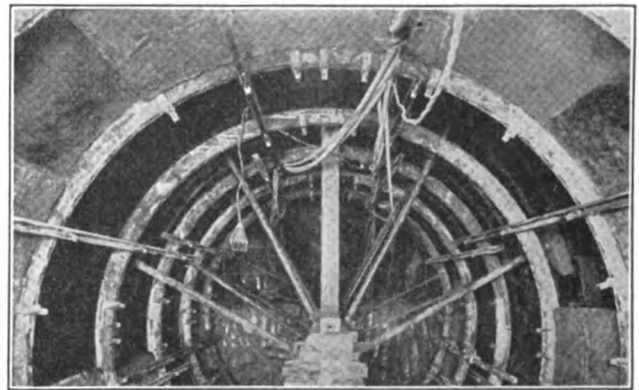
Hydraulic shaft forms are designed for quick erection and accurate alignment. The shaft form consists of curved sheets called units. These units are held to-

gether by rings and clamps. The units are made of No. 20 gauge metal and have a V-shaped edge the full length of each side. These units are pressed in one operation on large presses and are, therefore, exactly alike and absolutely interchangeable. They are made in three different widths and are called No. 6, No. 8 and No. 10 units. They are equal in width to the circumference of 6, 8 and 10 in. of diameter, respectively. Each of the three sizes are made in 36- and 72-in. lengths. The units are combined to form the various diameters of columns.

Sewer and Tunnel Forms—Hydraulic pressed steel forms are furnished for any curvature or combination of curves and tangents. On account of the ease and rapidity with which Hydraulic forms can be erected and taken down, a carrier is in most cases unnecessary. By using Hydraulic forms without a carrier an engineer or contractor can make his tunneling or open sewer work continuous on account of the maximum amount of clear space obtainable. By using Hydraulic forms for tunnel work one gang does not have to wait for another. Furnished for round, horseshoe, egg-shaped or elliptical concrete sewers or tunnels. Hydraulic sewer and tunnel forms are quick acting; only a hammer and pinch bar are needed to erect and remove them. No loose wedges are used; all wedges are securely attached to forms and can not be lost.

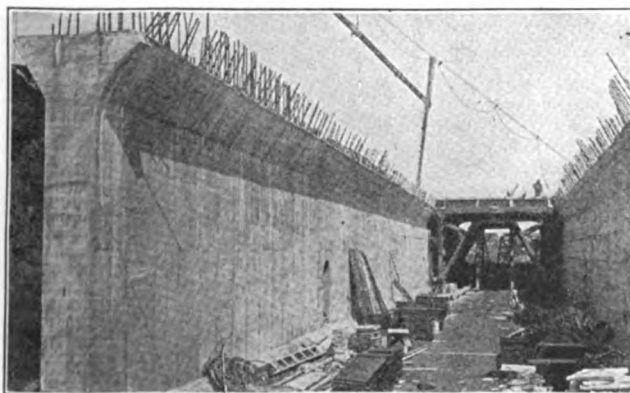
Service

THE HYDRAULIC STEELCRAFT Co. maintains an Engineering Service Department. Service is available to all users of Hydraulic equipment.



SEVEN MILE ROAD SEWER 11 FT. 6 IN. IN DIAMETER, DETROIT, MICH.

JOHN F. CASEY COMPANY, Pittsburgh, Pa., Contractor



RETAINING WALLS, NEW YORK CONNECTING RAILWAY
P. McMANUS, Inc., Philadelphia, Pa., Contractor



DETROIT EVENING NEWS, DETROIT, MICH.
GEO. A. FULLER CO., Detroit, Mich., Contractor

MARYLAND METAL BUILDING CO.

Race and McComas Streets
BALTIMORE, MD.

Product

PORTABLE yet PERMANENT, SECTIONAL
METAL BUILDINGS.

Use

The Maryland metal building is suitable for garages, summer cottages, factory buildings, field offices, bunkhouses, freight stations, watchman's houses, stores, warehouses, waiting stations, oil houses, tool houses, flagman's stations, gasoline service stations, portable school houses, etc. It can be erected by unskilled labor.

Description

The sheet metal covering of the Maryland metal building is of No. 24 gauge Lyonore Metal, a corrosion resisting alloy that will successfully withstand the elements. Lyonore metal has been on the market for a number of years and has been subjected to practical service tests under every condition, in mining districts, manufacturing communities, and salt air.

The Maryland metal building can be easily removed, increased or decreased in size, and the salvage value is practically 100%. The Maryland metal building, being absolutely light-



ningproof, fireproof, and rust resisting, will depreciate only slightly even after many years' service.

Sizes

Maryland metal buildings are carried in stock for immediate shipment, 8 to 60 ft. wide, clear span, in any lengths of 2-ft. multiples; 8-, 10-, or 12-ft. walls are standard heights. Can furnish special height walls as desired.

Equipment

Doors are of kalamein type, metal covered. Windows are standard metal sash, galvanized, equipped with ventilators, glazed with 1/4-in. rough wire glass unless otherwise specified. All hardware galvanized, hinges fitted with bronze hinge pins. As all members of the Maryland metal building interlock, the use of bolts is reduced to a minimum.

Directions

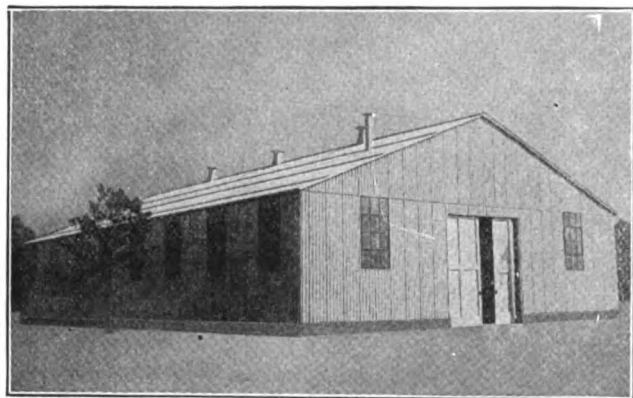
Complete drawings for foundations as well as instructions for erecting the building are furnished.

Literature

Catalogue and tentative drawings submitted on request.



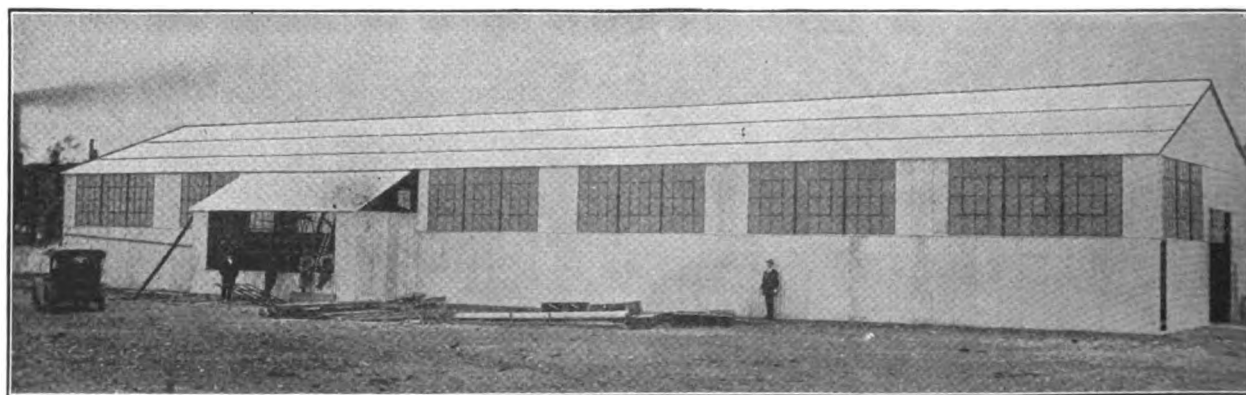
12x12x8 ft. Service Station, Harrisburg, Pa.



50x80x12 ft. Maryland State Roads Commission



Interior Philipp-Kell Co., Building



40x140x15 ft. Philipp-Kell Co., Baltimore, Md.

A FEW MARYLAND METAL BUILDINGS USED FOR VARIOUS PURPOSES

THE STEEL FABRICATING CORPORATION

Readybuilt Structural Steel Buildings for Industrial Purposes

GENERAL OFFICES AND WORKS
MICHIGAN, CITY, IND.

BRANCH OFFICES

NEW YORK, N. Y., 1270 Broadway
PITTSBURGH, PA.
SAN FRANCISCO, CAL., 444 Market Street
RALEIGH, N. C., 510-511 Tucker Building
ST. LOUIS, MO., 2153 Railway Exchange Building
NORFOLK, VA., 422 Seaboard Bank Building

BIRMINGHAM, ALA., 720 Brown-Marx Building
NORTH EMPORIA, VA.
CLEVELAND, OHIO, 707 Union Building
CHICAGO, ILL., 1550 McCormick Building
NEW ORLEANS, LA., 509 Chartres Street
DALLAS, TEX., 729 Western Indemnity Building

Product

READYBUILT STANDARDIZED STEEL INDUSTRIAL BUILDINGS.

Stefco Readybuilt Steel Buildings

Stefco Readybuilt steel buildings for industrial purposes are one-story structures, fabricated entirely of structural steel and assembled in the largest units possible for handling. They are 90% complete when leaving our works and their design is so simple that the erection is readily accomplished by ordinary labor.

Trusses—The trusses are of the Fink type, hot riveted throughout, standardized in single span widths from 10 to 60 ft. and successfully support overhead loads such as trolley distributing systems, line shafting, etc., without additional bracing.

Sidewall Sections—The sidewall sections are of structural steel, hot riveted throughout and are covered with corrugated galvanized steel sheets, also secured by rivets. They are standardized in heights to eaves of 8, 10, 12, 16, 20 and 24 ft. The roof covering is likewise of corrugated galvanized steel sheets secured to the purlins by bolts.

Windows — Stefco standard windows permit of almost unlimited lighting lay-



TRADE-MARK

outs to suit the desires of the purchaser.

Doors—Stefco doors are of either the hinged or sliding type and are standardized in sizes: single, 3x7 ft., 4x8 ft. hinged; double, 4x8 ft., 5x10 ft. hinged; single, 8 ft. x 7 ft. 4 in., 8 ft. x 9 ft. 4 in. sliding; double, 4 ft. x 9 ft. 4 in., 5 ft. x 9 ft. 4 in. sliding.

Ventilation—In addition to windows, ventilation is furnished if desired from the ridge of roof by the use of:

(1) Round fire retarding ventilators made of galvanized sheet steel.

(2) 3 ft. 6 in. ventilating truss monitor with or without snowproof and rainproof louvers.

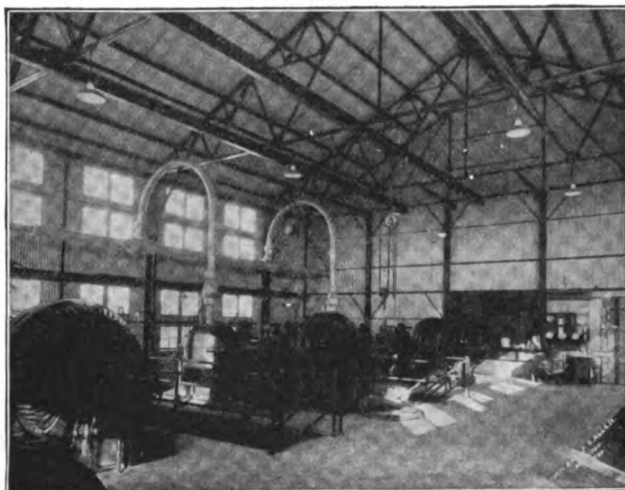
(3) 8-ft. wide steel monitor with 5-ft. high side-walls equipped with continuous ventilated steel sash and sash operating device.

Shipments from Stock

The standardization of Stefco units insures stock deliveries in any lengths and widths to suit the requirements of the purchaser.

Advisory Service Free

Our engineering experience and advice will save both time and money and is at your command without cost or obligation.



INTERIOR OF POWER HOUSE OF GULF PRODUCTION CO.,
GOOSE CREEK, TEX.
50x112x30 ft. high



MACHINESHOP OF GULF COAST MACHINE & SUPPLY CO.,
BEAUMONT, TEX.
36 ft. wide, 128 ft. long, 16 ft. high



CAR SHOPS OF LIVE POULTRY TRANSIT CO., CHICAGO, ILL.
Double, 40-80 ft. wide, 296 ft. long, 16 ft. high

TRUSCON STEEL COMPANY

Manufacturers of Standard Steel Buildings

YOUNGSTOWN, OHIO

For Branch Offices, see page 201

Product

TRUSCON STANDARD STEEL BUILDINGS, both Portable and Permanent.

For Reinforcing Steel, see pages 91-93; for Steel Sash, see pages 201-203.

Truscon Standard Steel Buildings

Truscon standard steel buildings are constructed of heavy gauge steel standard units, of uniform size, interchangeable, and assembled by means of a simple locking device consisting of a slotted bolt and wedge. Roofs and walls are of Truscon copper bearing steel, a material of proved durability. This construction furnishes a strong, permanent, fireproof structure that can be rapidly taken down and re-erected when necessary in a new location. There is 100% salvage.

The walls of these buildings are formed of panels that are interchangeable, as they are of uniform width. The walls are of heavy gauge steel—rigid and substantial. The windows, also of steel, are welded into the steel panels, affording maximum daylight and ventilation. The steel doors are furnished either single or double, and are equipped with Yale locks and Stanley hinges. The steel roof trusses support steel roof plates, tilelike in appearance and absolutely weatherproof. The building is strongly braced throughout and extremely rigid.

Truscon standard buildings, completely equipped, present a very pleasing appearance, and are ideal where daylighted, fireproof construction is desired and where quick expansion is necessary. They can be furnished in all sizes, and are adapted for use as factories, warehouses, schools, churches, hospitals, garages, dining halls, tool sheds, contractors' houses, etc.

Truscon standard buildings are furnished in any

TRUSCON
STANDARD BUILDINGS

TRADE-MARK

length; widths up to 120 ft., and of various types (see illustrations and diagrams). Any height of wall is secured by the heights of panels and varying curb heights. As panels are interchangeable, any desired arrangement of wall, windows and doors can be obtained.

Buildings can be taken down and re-erected, rearranged, enlarged or reduced as required. There is practically no deterioration in Truscon standard buildings.

Monitor and Sawtooth Buildings

The monitor type 3-M is especially adapted for use where additional headroom, light and ventilation are required, such as in foundries, erecting shops, etc. Provision is easily made for traveling crane in central bay.

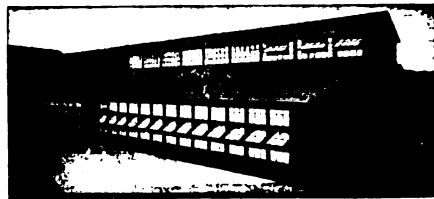
The sawtooth type is adapted for machineshops and manufacturing generally, assuring maximum lighting and ventilation. Trusses are designed to support 1000 lbs. at any panel point.

Further Information

For complete information, specifications, etc., write for the Truscon Standard Building Catalogue.



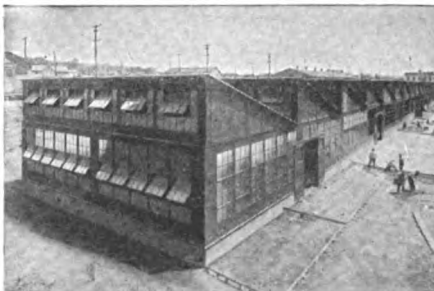
TYPE 4 TRUSCON STANDARD BUILDING 80 FT. AND 60 FT. WIDE



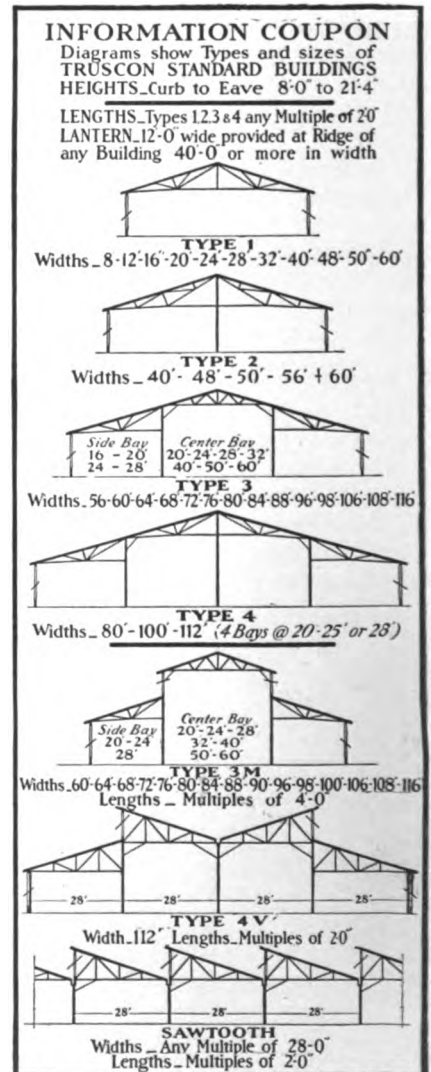
TYPE 3M (MONITOR) TRUSCON STANDARD BUILDING



INTERIOR OF 80-FT. WIDE TRUSCON STANDARD BUILDING, TYPE 4



50x500-FT. SAWTOOTH TYPE TRUSCON STANDARD BUILDING



TRUSCON STANDARD BUILDINGS

GRAVER CORPORATION

Water Softening and Purifying Equipment

EAST CHICAGO, IND.

CHICAGO OFFICE, 1412 Steger Building

Products

Designers and builders of WATER SOFTENING, PURIFYING, STERILIZING and FILTRATION EQUIPMENT for municipal, industrial and domestic use; RECIRCULATING or REFILTERING SYSTEM for SWIMMING POOLS.

For General Steel Plate Construction, see page 465.



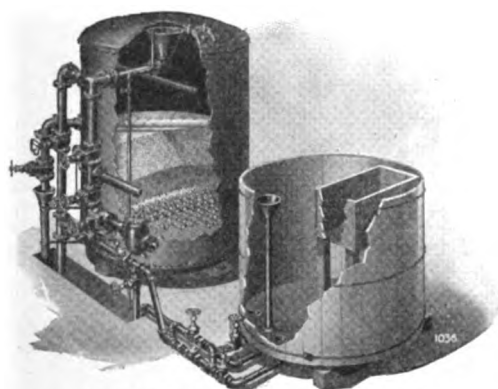
TRADE-MARK

be removed by sedimentation and filtration. (2) Thermal action, using heat to hasten chemical reaction and reducing the power of water to hold certain salts in solution.

We guarantee water delivered by this softener to have a temperature of 210° Fahr. and that subjected to any test or operating conditions, it will deliver, always and uniformly, a water 1½ to 2½ grains per U. S. gallon of total hardening ingredients.

Graver Zeolite Water Softener

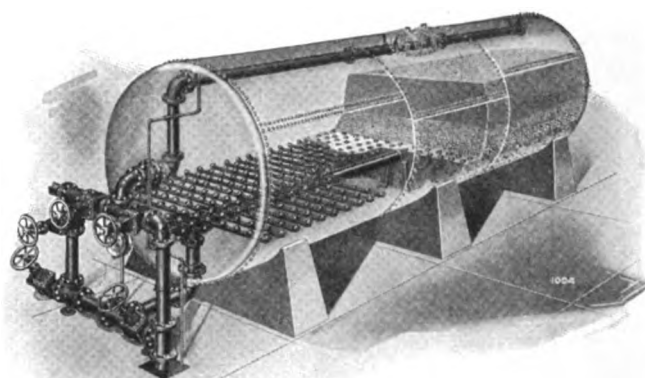
The Graver zeolite softener consists of essentially two parts; the softener itself, a steel shell acting as container for the zeolite mineral, and a salt regenerating solution tank. All trace of hardness (zero by soap test), is removed from the water by simple filtration, under pressure, through a bed of Graver zeolite. This water softener is made in a range of sizes suited both to industrial and domestic use.



GRAVER ZEOLITE WATER SOFTENER

Graver Water Filters

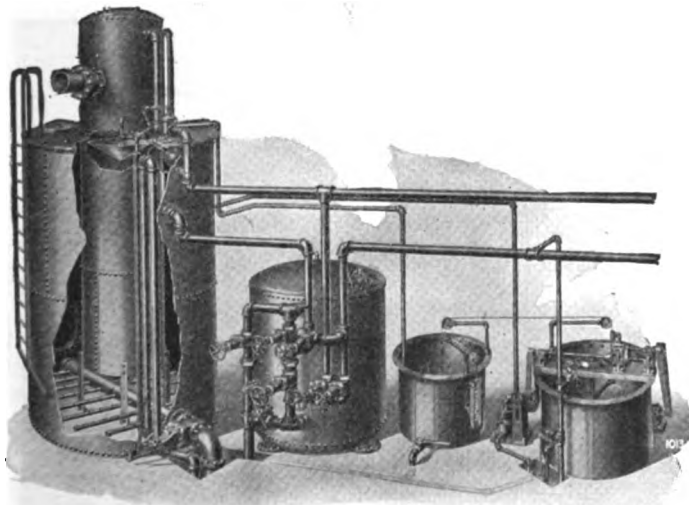
Graver filters are made in both vertical and horizontal styles, with two different types of feed; the open or gravity type and the closed shell or pressure type. Each style furnished in a variety of sizes to suit conditions, either in single units or in batteries. They are ideal in treating water for all industrial purposes.



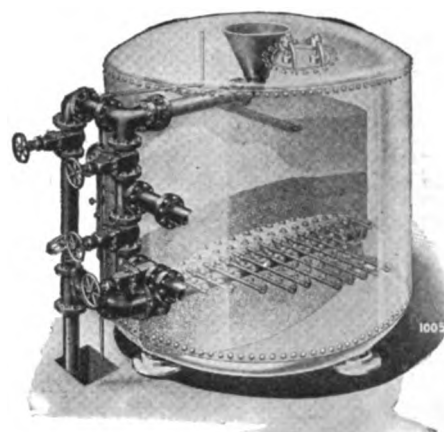
GRAVER WATER FILTER—HORIZONTAL TYPE

Graver Hot Process Water Softener

Designed to furnish purified, softened and heated water for boiler feed purposes. Combines two distinct methods in the process of water softening: (1) Chemical action by which the injurious ingredients in the water are precipitated in such form that they can readily



GRAVER HOT PROCESS WATER SOFTENER



GRAVER WATER FILTER—VERTICAL TYPE

Graver Refiltering or Recirculating System for Swimming Pools

Recirculates, filters, heats and disinfects so that complete change is made daily in the water of the pool. The most economical method in use. Filters for "fill and draw" method can be supplied.

NORWOOD ENGINEERING CO.

Mechanical Filters and Water Purification Plants

FLORENCE, MASS.

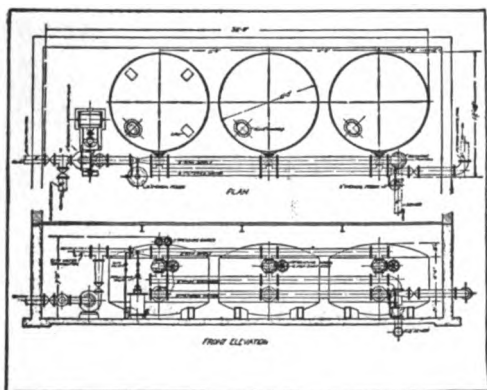
Products

GRAVITY and PRESSURE FILTERS for domestic, industrial and municipal requirements.

SWIMMING POOL FILTERS for purifying water in swimming pools, and maintaining pure water in pool.

Pressure Filters

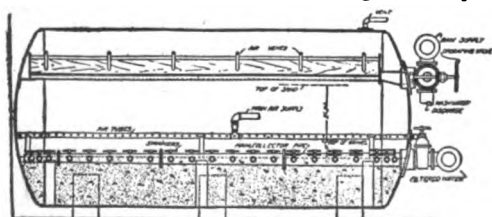
Vertical Type—The Norwood vertical type pressure filters are built in sizes from 12 in. in diameter up to and including 120 in., with capacities from 2000 to 75,000 gals. per day for each unit, as indicated in table shown. These capacities may be increased by using multiple units in battery, as illustrated. Sizes up to 30 in. in diameter are made of the best possible grade of gray cast iron, carefully machined and assembled. The large sizes are flange steel plate construction, thoroughly tested and made watertight before shipment. An alum coagulant feeder is furnished on the supply to the filters for color removal, and the best grade of filtering sand and gravel is supplied for filtering medium.



VERTICAL PRESSURE FILTERS

Diam., in.	Filtering area, sq. ft.	Capacities, gallons per minute		Min. wash water per sq. ft. per min., gals.	Size of pipe connections, in.	
		2 gals. per sq. ft.	3 gals. per sq. ft.		Inlet and outlet	Wash to sewer
12	.785	1.57	2.36	9.42	3/4	1
14	1.06	2.12	3.18	12.72	1	1 1/4
16	1.39	2.78	4.17	16.68	1 1/4	1 1/2
20	2.18	4.36	6.54	26.16	1 1/2	2
24	3.14	6.28	9.42	37	1 3/4	2 1/2
30	4.9	9.8	14.7	60	2	3
36	7.06	14.1	21.1	84	2 1/2	3 1/2
42	9.62	19.2	28.8	115	2 3/4	4
48	12.56	25.1	37.6	150	3	4 1/2
54	15.9	31.8	47.7	190	3 1/2	5
60	19.63	39.2	58.8	235	4	5 1/2
72	28.27	56.5	84.8	339	4 1/2	6
84	38.48	76.9	115.4	460	5	6 1/2
96	50.26	100.5	150.8	600	5 1/2	7
120	78.54	157	235.6	942	6	8

Horizontal Type—Built in sizes that range from 200,000 gals. per day upward. The horizontal filters are all 8 ft. in diameter, with lengths varying with



SECTIONAL VIEW—HORIZONTAL PRESSURE FILTER

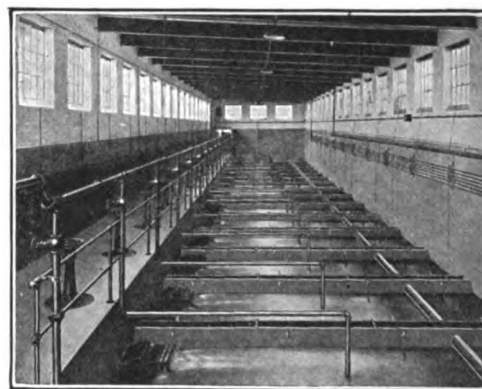
capacities desired. These filters are equipped with a complete manifold strainer system and furnished with a steel plate wash trough, as shown on cut. The Norwood system of separate air wash may be installed in either the horizontal or vertical pressure filters.

HORIZONTAL PRESSURE FILTERS

Diam. and over all length, ft.	Filtering area, sq. ft.	Capacities, gallons per minute		Min. wash water per sq. ft. per min., gals.	Size of pipe connections, in.	
		2 gals. per sq. ft.	3 gals. per sq. ft.		Inlet and outlet	Wash to sewer
8x10	68.5	137	295.5	822	6	8
8x12	83.4	166.8	250.2	1000	6	8
8x14	98.2	196.4	294.6	1178	6	8
8x16	113.1	226.2	339.3	1357	8	10
8x20	142.7	285.4	428.1	1712	8	10
8x25	179.8	359.6	539.4	2157	8	10

Gravity Filters

Built in diameters from 5 to 20 ft. of steel or wood, and of any size in concrete construction to suit conditions and location. Illustration shows a gravity plant designed for industrial requirements. Designs to meet local conditions submitted on request. Whenever filtered water is to be used for domestic purposes, and it is necessary to secure full bacterial purification, capacity of filter should be based on a rate of filtration not to exceed 2 gals. per sq. ft. of filtering area per min., and a coagulant should be used. A rate of 2 to 4 gals. per sq. ft. per min. can be used when filtering a municipal supply of approved bacterial purity. A rate of 2 to 4 gals. per sq. ft. per min. is suitable for swimming pools and industrial purposes.



25,000,000-GALLON CONCRETE GRAVITY FILTER

Swimming Pool Filters

The Norwood 3-unit filter system for re-filtration of swimming pools is conceded to be the most effective and economical installation known.

Municipal Filters

The NORWOOD ENGINEERING COMPANY is prepared to design, build and equip municipal filter plants of any capacity, for purification of drinking water. We specialize in water works problems.

Co-operative Service

This company maintains a competent staff of sanitary engineers, available for consultation, who will make recommendations to insure satisfactory results.

THE REFINITE COMPANY

Water Softeners and Filters
GENERAL OFFICES AND LABORATORIES

MANUFACTURING AND
ASSEMBLING PLANT
OMAHA, NEBR.

Refinite Building
OMAHA, NEBR.

MINES AND WORKS
ARDMORE, S. DAK.

DISTRICT OFFICES

CHICAGO, ILL. (Central District), Special Display Salesrooms, 908 South Michigan Avenue

SAN FRANCISCO, CAL. (Western District), 417-421 Call Building

NEW YORK, N. Y. (Eastern District), 543 Cortlandt Building, 30 Church Street

CANADA, THE REFINITE CO. OF CANADA, LTD., 319 Continental Life Building, Toronto

Products

REFINITE WATER SOFTENERS; BOOTH
LIME-SODA WATER SOFTENERS; REFINITE
RAPID PRESSURE FILTERS.

REFINITE
EVAL OF THE GOODS

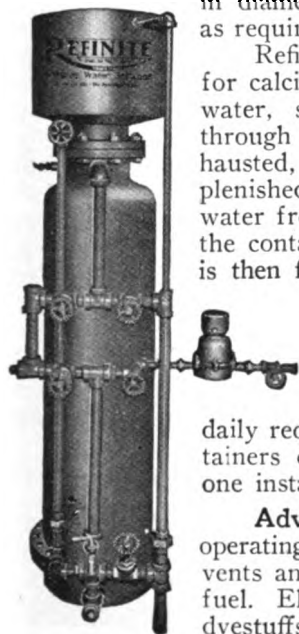
Nature's Water Softener
Copyright 1920—The Refinite Company

Refinite Water Softener

This system consists of a tank containing a bed of Refinite mineral, a natural softening agent, with necessary piping, inlet and outlet valves, water meter and brine tank, strainer system, equipped with patented sand valve, preventing any loss of mineral through backwash. Attachment is made direct to cold water supply line. Standard sizes from 12-in., up to and including 96-in. in diameter. Special and larger sizes as required. Horizontal and upright.

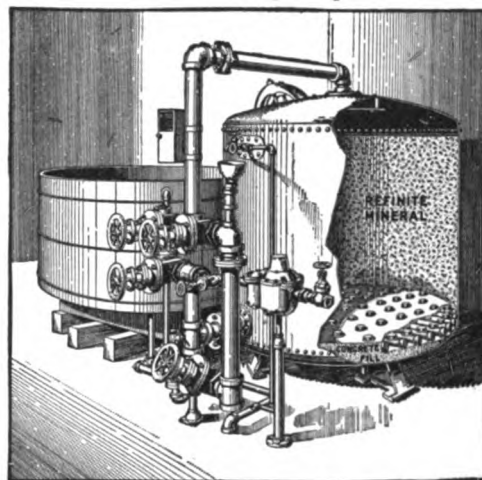
Refinite mineral exchanges sodium for calcium and magnesium present in water, softening the water passing through the mineral bed. When exhausted, the sodium component is replenished by allowing common salt water from the brine tank to remain in the container a few hours. The brine is then flushed out and the mineral is again ready for a capacity run. Economical; no expert supervision. Necessary size for installations is determined by hardness of water and daily requirements. Two or more containers or units may be connected in one installation.

Advantages—This system lowers operating costs in power plants. Prevents and removes boiler scale. Saves fuel. Eliminates shutdowns. Saves on dyestuffs in textile mills. Makes fast vat dyeing possible; improves "feel" and luster of finished products; saves soap in degumming of silk and scouring of wool. Saves up to 50% on wash-



REFINITE
WATER
SOFTENER,
DOMESTIC
TYPE

room supplies in laundries; improves appearance of laundered clothes. Provides perfect soft water in homes for all toilet and household uses. For hotels, hospitals, institutions, etc. Desirable for beauty parlors, hair dressing shops, barber shops, etc.



SECTIONAL VIEW OF REFINITE WATER SOFTENER,
INDUSTRIAL TYPE

Prevents lime scale in dishwashing machines. As advantageous as distilled water for bottlers and beverage manufacturers for saving syrups and preventing growth in bottled products. Clarifies ice. Used in the tanning industry for insuring quicker and more even tanning and dyeing. Complete instructions and working plans furnished. Any plumber can install.

Booth Lime-soda Water Softener

Continuous type, using milk-of-lime and soda ash. Standard and conical types. For railroads, municipalities and larger steam power and central heating plants. Prevents boiler scale.

Advantages—Feeding and proportional regulation at ground level. Ample time for softening and clarifying. Large softening tank. Chemical reagent tank holds 12-hour supply at maximum capacity. Chemical feed controlled by flow of incoming water, measures amount of chemical solution regardless of fluctuations. Power obtained from incoming water, motor or gas engine.

Refinite Rapid Pressure Filter

Sand and gravel type. Three styles. Sizes to suit individuals needs. Removes or reduces impurities—other than calcium and magnesium—present in the water.

Guarantees, Literature

Each Refinite or Booth installation is built and guaranteed to give absolute satisfaction, and to accomplish definite results at definite cost. Analyses of water and all investigations, recommendations, etc., made free of charge. Complete descriptive literature on request.

SPECIFICATIONS, DIMENSIONS AND WEIGHTS, STANDARD REFINITE WATER SOFTENERS

Size	Floor space required for installation, ft.-in.	Height, in.		Brine tank, in.		Weight of brine tank full, lbs.	Total weight of softener in operation, lbs.
		Shell	Over all	Out-side diam.	Out-side stave		
Vertical Type	12 2-5x 2-2	48	*68	16	12	180	815
	16 2-6x 2-6	49	*74	19	17	320	1330
	20 3-0x 3-1	50	*73	24	14½	425	2055
	24 3-4x 3-8	50	*74	26	14½	500	2280
	30 3-10x 4-4	72	81	42	36	1500	3650
	36 4-9x 5-3	72	84	48	36	2040	4840
	42 5-0x 5-10	72	84	56	36	2745	6795
	48 5-3x 6-7	54	78	66	36	3850	9225
	60 6-1x 7-9	54	82	69	48	4360	12535
	72 6-8x 8-10	54	85	84	48	8650	19850
	84 7-8x 10-5	54	90	96	48	11360	27810
	96 7-11x 11-2	54	96	108	48	14440	36715
Horizontal	812 8-2-16-11	..	112	Made to suit conditions		..	76000
	814 8-2-18-11	..	112			..	86000
	816 8-2x 20-11	..	112			..	96000

*Includes brine tank.

THE PERMUTIT COMPANY

Water Rectification

440 Fourth Avenue
NEW YORK, N. Y.

BRANCH OFFICES

TELEPHONE

MADISON SQUARE 0965

CABLE ADDRESS

"PERMUTIT NEW YORK"

ALBANY, N. Y., 310 Journal Co. Building
BOSTON, MASS., 10 Milk Street
BUFFALO, N. Y., 304 Brisbane Building
CHATTANOOGA, TENN., 435 Volunteer State Building
CHICAGO, ILL., 208 South LaSalle Street

HAMILTON, ONT., W. J. WESTAWAY, Main & McNab Streets

ST. LOUIS, MO., REEVES & SKINNER MACHINERY Co., 2211 Olive Street

AGENTS

KANSAS CITY, MO., 507 Lathrop Building
LOS ANGELES, CAL., 909 Wright-Callender Building
MINNEAPOLIS, MINN., 1046 McKnight Building
PITTSBURGH, PA., 921 Union Arcade
PHILADELPHIA, PA., 311 Widener Building

MONTREAL, QUE., W. J. WESTAWAY, 400 McGill Building

Products

PERMUTIT ZEOLITE, LIME-SODA, and HEATER, WATER SOFTENERS; IRON and MANGANESE REMOVAL PLANTS; WATER, and OIL REMOVAL FILTERS; and APPARATUS for the Removal of other Mineral and Organic Matter, Color, Odor, Objectionable Gases and Tastes.

Patents in United States, Canada and other countries.



TRADE-MARK

claimed and stored for further use. The unreclaimed brine passes out to the sewer as a clear solution.

The cost of operation is extremely low and due to its automatic features, no skilled attention is required. There is no sludge of any character to contend with.

Advantages—Water softened by Permutit is ideal for industrial and domestic purposes. It obtains results.

In Boiler Plants—Entire prevention of scale, sludge and mud. Elimination of the burning out of tubes due to scale and mud. Elimination of expensive boiler cleaning, due to scale and mud. Important fuel saving, 10% to 20% and upwards.

In Laundries—Soap saving averaging more than 50%. An even greater saving in soda. Appreciable fuel saving. Great improvement in the quality of the work.

In Dye Houses—Important saving in dye stuffs. Certainty of absolute matching of shades. Elimination of claims due to faulty dyeing. Improvement in feel and luster of finished goods.

In Textile Mills—Valuable reductions in time of processing. Large savings of soap, soda, alkali and mill supplies in woolen and silk mills. Important improvements in grades, feel, luster and quality.

Bleaching—Pure whites, without spots. Greatly

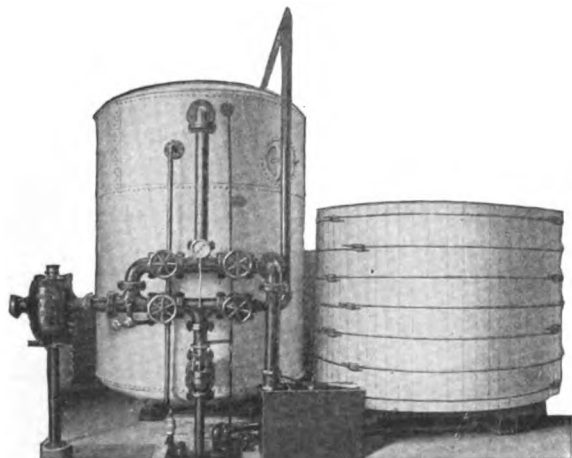
Service

A competent staff of engineers and chemists and well equipped laboratories are maintained for studying local conditions and regulating choice of types that will satisfy the requirements of any particular problem. Scientific investigations of water supply, analyses of water, layouts of plants, are made free of charge and without obligation.

Zeolite Water Softeners

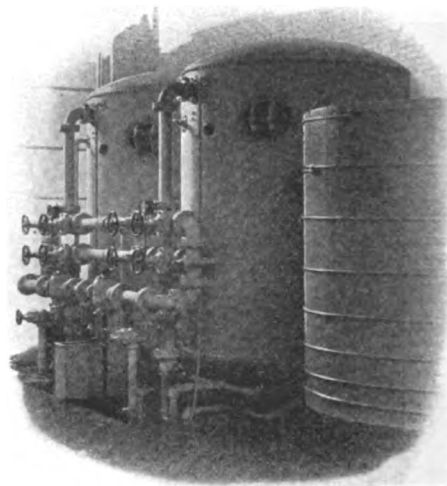
A Permutit zeolite water softener consists of a shell or tank containing Permutit zeolite, through which water is passed. By a process of "base exchange" the Permutit material abstracts all calcium and magnesium from the water, delivering a uniform supply that is clear, clean and absolutely soft.

When a designated amount of water has been softened, the Permutit is regenerated and restored to its original condition by dosing it with salt, which passes through the softener as a brine and is partly re-



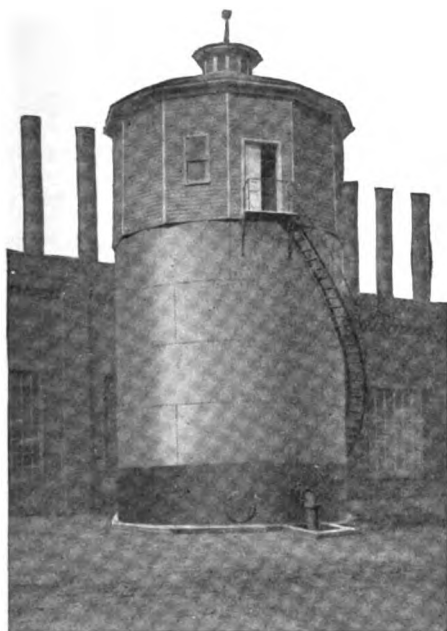
ZEOLITE STEEL PRESSURE WATER SOFTENER

Very little space occupied and softener can be operated by unskilled labor at a minimum cost



PERMUTIT ZEOLITE WATER SOFTENERS INSTALLED IN PARALLEL FOR 24-HOUR SERVICE

One unit operates while the other is being regenerated



LIME-SODA EQUIPMENT AT A LARGE OIL REFINERY
Permutit lime-soda water softeners are designed to fit special operating conditions and embody the best acknowledged improvements in design

increased tensile strength and softness. Dependable uniformity of results. Important saving in time. Appreciable economy of bleaching agents.

Finishing—Very great savings in soap. Important economy in time. Improvement in feel and luster. Uniform results.

Guarantee—Permutit zeolite water softeners are sold under a guarantee to deliver their rated capacity of clear, neutral water that is absolutely free from all hardness and all scale, sludge or mud forming impurities. No deposits can form in boilers or their connections when fed with the softened water.

Lime-soda Water Softeners

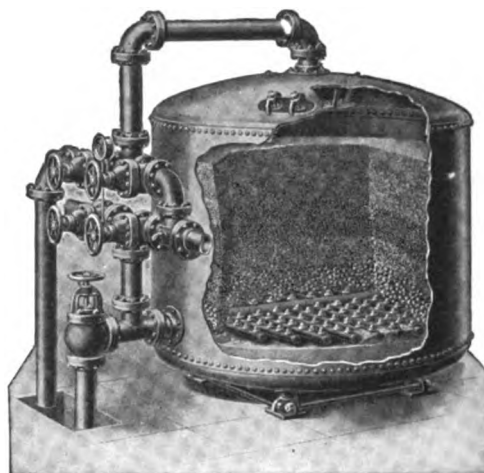
Permutit lime-soda water softeners are used for softening water for all industrial or municipal purposes, where water of zero hardness is not required. They are built in continuous and intermittent types, of steel, wood or concrete, and may be either ground level or top operated. According to requirements, they may be installed to operate in conjunction with Permutit zeolite water softeners or other auxiliary equipment. Special or standard apparatus is built for any capacity.

Heater Lime-soda Water Softeners (Hot Process)

Hot process lime-soda water softeners are principally used for softening boiler feed water where it is desired to reduce the hardness of the softened water to a lower point than can be reached in the cold. They are built for any capacity and consist generally of a steel settling tank, over which is located a heater, the hot water flowing into the settling tank by gravity.

Iron and Manganese Removal Plants

These plants are furnished to provide "iron free" and "manganese free" water for boiler feed and all industrial and municipal purposes. They may consist of mechanical or chemical equipment, used singly or in combination, and include such apparatus as aerators, chemical feeding devices, settling tanks, oxidizing filters, etc. A special zeolite is frequently used in this service.



PERMUTIT WATER FILTER
Permutit water filters represent the highest achievements in water filter design. They are constructed of the best grade materials, fabricated with superior workmanship

Such Permutit plants are built in any capacity to fulfill any operating requirements, the choice of type being governed by the quantity and quality of water to be treated, the amount and form in which the iron appears, and local conditions.

Water Filters

Water filters are generally used only for the removal of suspended matter and color from water, the filtering medium being sand for the most part. They are built in both pressure and gravity types for any capacity, ranging from domestic requirements to municipal supplies, and are constructed of steel or concrete according to conditions.

Oil Removal Filters

For the removal of oil, odors, objectionable gases and tastes, numerous mechanical means are utilized, as well as various filtering substances. Such equipment is likewise built for any capacity and may be specially designed to satisfy specific requirements. Condensate and other water impregnated with oil can be completely freed of oil whether existing in suspended or emulsified form.

All Permutit filters embody the best acknowledged features in filter design and contain, in addition, many refinements that make for utmost satisfaction in maintenance and operation. Only the highest grades of materials and carefully selected filtering mediums are employed, which combined with superior workmanship and improved designs, guarantee maximum economy in producing the most desirable results. Chemical dosing apparatus, which may be required, is available in the size and type indicated by local requirements, and is built with the same high standard of materials, workmanship and design.

Filtration Equipment

Filtration equipment, such as gauges, rate of flow controllers, operating tables, etc., is designed with utmost care. All materials required for rapid sand filter plants, together with plans and skilled engineering service, are available. Such materials and workmanship are of the highest grade, and assure dependable and accurate service.

ROBERTS FILTER MANUFACTURING CO.

DARBY, PA.

Products

CAST IRON and STEEL VERTICAL PRESSURE FILTERS.
STEEL HORIZONTAL PRESSURE FILTERS.

WOOD TANK GRAVITY FILTERS; CONCRETE GRAVITY FILTERS.

Also manufacturers of Water Softening Apparatus.

Slogan

Water Fit For Use.

Co-operative Service

We make a specialty of water works engineering problems which can not be covered by our standard apparatus.

Recommendations will be made, plans prepared, and estimates submitted if you will acquaint us with the details of the water difficulty. Wherever conditions justify, an expert will be sent to investigate water works systems and to collect data necessary for determining the proper remedies. This service is intended to co-operate and not to conflict with the work of any representative or engineer appointed by the prospective purchaser.

How to Specify Roberts Filters

Filters should be specified either by the inside diameter of the unit or by a stated per minute capacity at a definite rate of

filtration expressed in gallons per minute per square foot of filtering area.

The rate of filtration that may be safely employed in a given case is determined by two factors; first, the character of the raw water; second, the quality of the filtered water desired. When bacterial efficiency and complete clarification are desired, a 2-gal. unit rate is the maximum. For clarification of a turbid water use a 2-gal. rate. If the water is already fairly clear, a 3- or 4-gal. rate may be used. In the purification of water for swimming pools, the 3-gal. rate is usually employed.

In a pressure filter installation always specify the maximum pressure to which the filters will be subjected in operation.

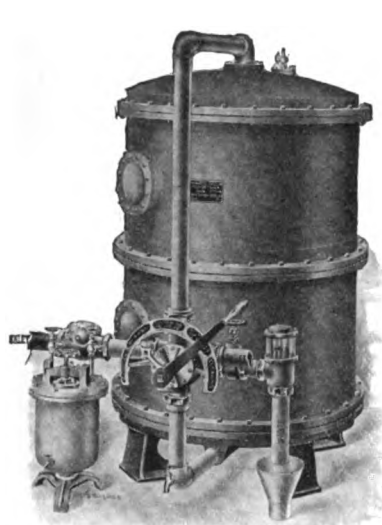
When asking for recommendations as to proper treatment for filtration or other water purification problems, submit either a sample of water or an analysis covering the following points: turbidity, color, erythrosine alkalinity (as CaCO_3); phenolphthalein alkalinity; incrustants (as CaCO_3); magnesium (as Mg); iron (as Fe).

Roberts Standard Vertical Pressure Filters

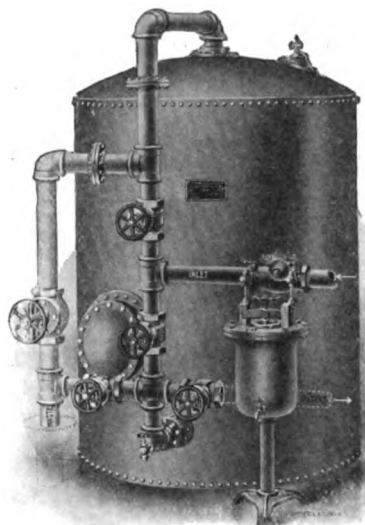
The style "E" filter illustrated below is constructed of cast iron and is capable of withstanding working pressures up to 60 lbs. per sq. in.

The styles "H" and "L," also shown, are constructed of steel and are designed either for 60 or 100 lbs. per sq. in. working pressure.

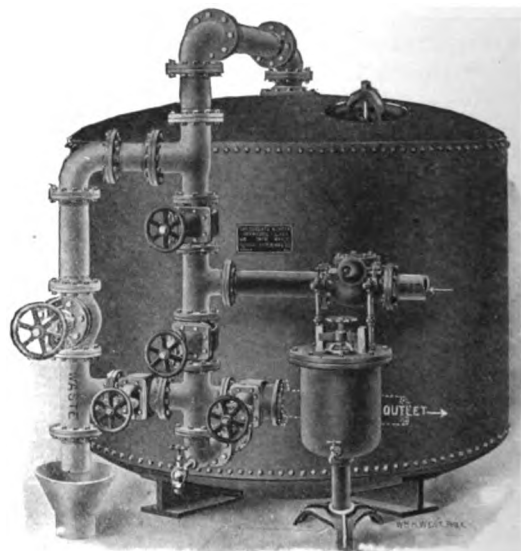
All filters are furnished substantially as shown in the illustrations; with full charge of filtering material, immediate filter pipes, valves and fittings, and pressure coagulant feeding device.



Style "E"



Style "H"



Style "L"

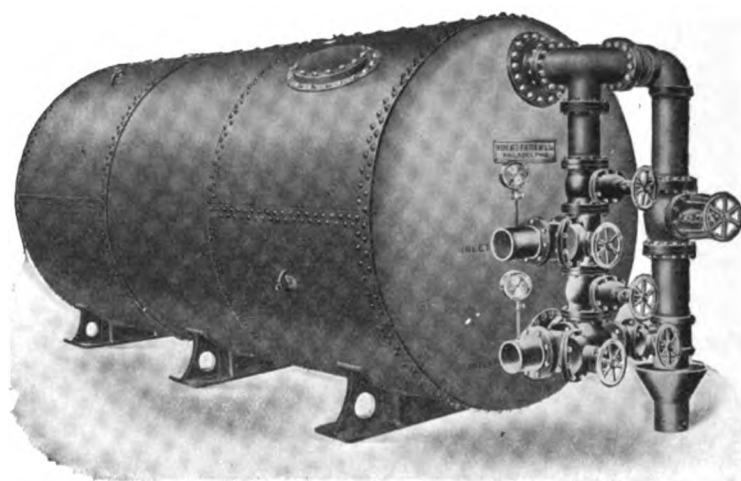
ROBERTS STANDARD VERTICAL PRESSURE FILTERS

Size	Style	Filtering area, sq. ft.	Capacities, 2- and 3-gal. rates				Height over all, in.	Floor space, ft.	Inlet and outlet, in.	Waste, in.	Shipping weight, lbs.				
			Minute	Hour	24 hours						Shell	Pipe and parts	Sand and gravel		
12	E	.78	15	23	94	140	2260	3360	58	3 x 2½	1	1¼	290	99	290
16		1.39	28	42	167	250	4010	6000	63	3 x 3	1	1¼	423	104	530
20		2.19	44	66	263	394	6320	9460	64	3 x 3	1	1¼	652	111	830
24		3.14	63	94	377	565	9050	13550	64	3¼ x 3	1½	1½	880	140	1190
30		4.91	98	147	589	884	14150	21300	74	4½ x 3	1½	2	1338	363	1850
36		7.07	141	212	848	1273	20360	30600	76	5 x 3½	2	2½	1880	451	2660
42		9.62	192	289	1154	1732	27700	41600	78	6 x 4	2	2½	3508	521	3630
48		12.56	251	377	1508	2262	36200	54300	79	6¼ x 5	2½	3	4827	702	5120
30		4.91	98	147	589	884	14150	21300	73	4½ x 4	1½	2	1300	269	1730
36		7.07	141	212	848	1273	20360	30600	75	5 x 4	2	2½	1530	355	2480
42	H	9.62	192	289	1154	1732	27700	41600	76	5½ x 4	2	2½	1992	357	3630
48		12.56	251	377	1507	2262	36200	54300	77	6¼ x 4½	2½	3	2439	474	4720
54		15.90	318	477	1908	2862	45800	68800	78	6½ x 5	2½	3	3336	474	5970
60		19.63	393	589	2356	3533	56500	84800	79	7 x 5½	2½	3	3918	474	7370
72	L	28.27	565	848	3392	5089	81500	122100	94	8½ x 6½	3	4	3700	840	10610
78		33.17	663	995	3980	5971	95500	143300	96	9 x 7	3	4	4100	882	12450
84		38.48	769	1154	4618	6924	110900	166200	98	10 x 7½	4	5	4700	1284	14450
96		50.26	1005	1508	6030	9048	144800	217000	100	10½ x 8½	4	5	5400	1375	18860

Roberts Horizontal Pressure Filters

These filters are constructed of steel and designed either for 60 or 100 lbs. per sq. in. working pressure. They are furnished with full charge of filtering material, immediate outside pipes, valves and fittings, and pressure coagulant feeding device. The shells are tested to hydrostatic test pressure 50% in excess of that under which they are intended to operate. All external piping is standard wrought pipe with cast iron flanged and screwed fittings. All valves are of the gate pattern, double disk, wedge type, with iron body and bronze mountings, except on the waste line, which is of the globe type.

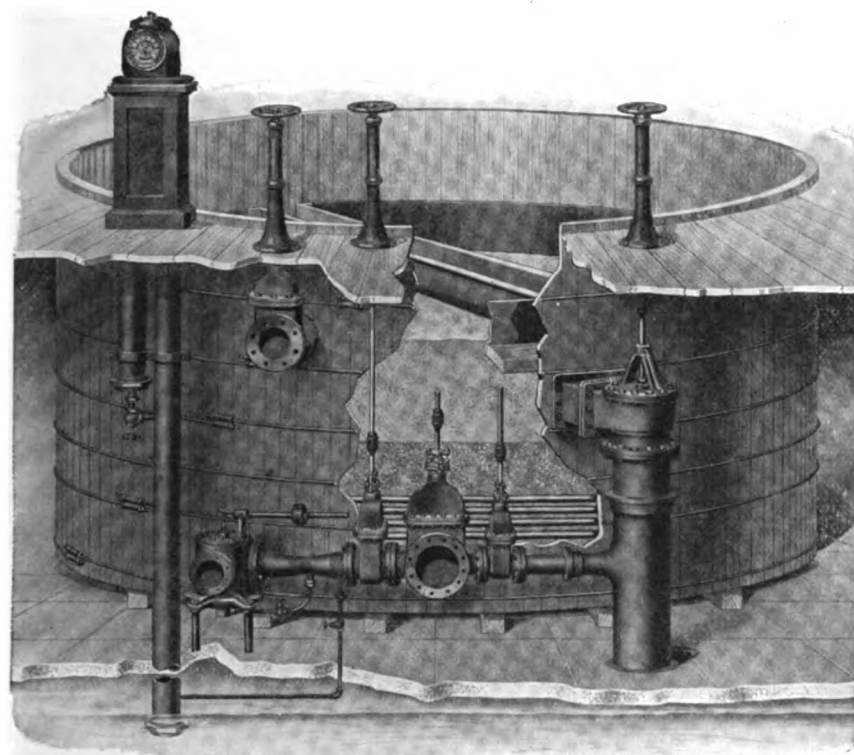
Pressure gauges are furnished on raw water influent and filtered water effluent pipes. Supporting cradles are of heavy cast iron.



ROBERTS HORIZONTAL PRESSURE FILTER

ROBERTS STANDARD HORIZONTAL PRESSURE FILTERS

Size		Filtering area, sq. ft.	Capacities, 2- and 3-gal. rate				Inlet and outlet, in.	Waste, in.	Shipping weights, lbs.		
Inside diam., ft.	Length over all, ft.		Minute	Hour	24 hours				Shell	Pipe and parts	Sand and gravel
8	10	65	129 194	7750 11620	185760 278640	6	6		8210	2725	29500
8	12	79	157 235	9420 14100	226080 339120	6	6		9310	2884	36000
8	14	93	185 278	11100 16650	266400 399600	6	8		10810	3300	42000
8	16	107	213 320	12800 19200	306720 460080	6	8		12810	3539	48000
8	20	135	269 404	16150 24200	387360 581040	6	8		14215	3993	60000
8	25	170	339 508	20350 30500	488160 732240	8	10		17215	6505	72000



ROBERTS WOOD TANK GRAVITY FILTER

Roberts Gravity Filters

The illustration represents the standard wood tank high rate wash gravity filter unit such as is commonly employed in industrial installations and the smaller and more temporary municipal plants. They are usually operated, however, in conjunction with a wood tank settling basin. The type of filter shown is furnished complete with manifold and strainer system, filtering material, circumferential and cross wash troughs, immediate pipes, valves and fittings, rate controller and indicating loss of head gauge. The valves are operated by means of hand wheels with floor stands and extension stems.

Wood tank gravity filters may also be equipped with mechanical agitator. When this type is desired, full particulars will be sent on request.

Standard designs for concrete plants will be submitted on request.

ROBERTS STANDARD WOOD TANK GRAVITY FILTERS

Inside diam., ft.	Filtering area, sq. ft.	Capacities, 2- and 3-gal. rate				Pipe sizes, in.					Strainer system		Shipping weights, lbs.		
		Minute	Hour	24 hours		Influent	Effluent	Wash	Waste	Rewash	Manifold in.	Lateral in.	Tank	Pipe and parts	Sand and gravel
6	2827	56 84	3260 5040	77600 121000	4	4	4	8	3	4	1 1/2	1 1/2	2000	2840	10600
8	5026	100 150	6000 8000	144000 272000	4	4	6	8	3	6	1 1/2	1 1/2	3000	4050	18848
10	7854	157 235	9430 14100	226000 339000	6	4	8	10	3	8	1 1/2	1 1/2	4000	5484	29453
12	11310	230 345	13800 20700	335000 500000	6	4	8	10	4	8	1 1/2	1 1/2	5000	5920	42413
14	15394	310 460	18600 27600	450000 660000	8	6	10	12	4	10	1 1/2	1 1/2	6000	7500	57728
15	17671	350 530	21000 32000	500000 750000	8	6	10	12	4	10	1 1/2	1 1/2	7500	7800	66267
16	20106	400 600	24000 36600	580000 860000	8	6	12	14	4	12	1 1/2	1 1/2	9000	9000	75398
17	22698	450 680	27000 40000	650000 1000000	8	6	12	14	4	12	1 1/2	1 1/2	10000	9300	85118

WM. B. SCAIFE & SONS CO.

Water Filters and Water Softening Systems

Executive Offices, Laboratory and Works OAKMONT, PA.

PITTSBURGH OFFICE, First National Bank Building

NEW YORK OFFICE, 26 Cortlandt Street

CHICAGO OFFICE, First National Bank Building

Member of Associated Manufacturers of Water Purifying Equipment

Products

Manufacturers of SCAIFE PATENTED WATER FILTERS of any capacity for residences, public buildings, factories and municipalities, including PATENTED SAND and CHARCOAL FILTERS; TANDEM PATENTED STEEL PRESSURE FILTERS, vertical and horizontal.

SCAIFE and WE-FU-GO WATER SOFTENING SYSTEMS for boiler feed water, for domestic use and for every industrial purpose.

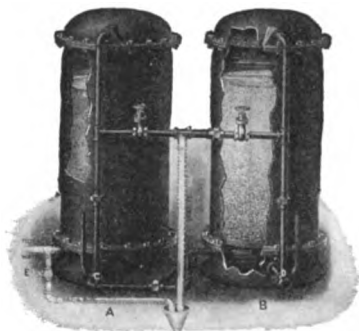
Also Mechanical Gravity Filters and Re-filtering Systems for swimming pools.

Double Combination Sand and Charcoal Filters

Scaife patented sand and charcoal filters for the removal of iron, color, objectionable odor or taste. These filters are specially constructed and adapted for private residences, small apartments, the manufacture of soft drinks and similar uses, requiring bright clear water free from iron, odor or taste.

Made of cast iron for maximum working pressure of 100 lbs. per sq. in. The water, when double filtered, is first passed through quartz filled cylinder and then through the other filter, which contains pure animal charcoal.

The charcoal filter never comes in direct contact with the impure water from the supply; therefore its efficiency for removing impurities causing color, odor or taste is not impaired by suspended matter.



DOUBLE COMBINATION CAST IRON SAND AND CHARCOAL FILTERS

DOUBLE COMBINATION SAND AND CHARCOAL FILTERS

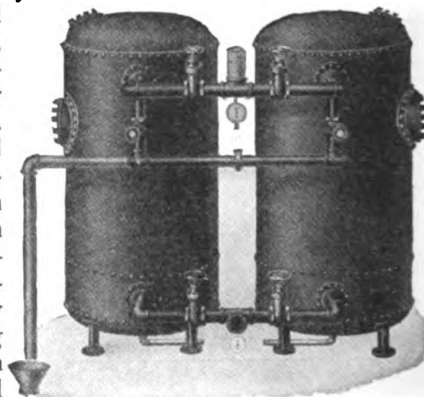
Cat. No.	2 units, diam. of unit, in.	Height, ft. in.	Filter area, single unit, sq. ft.	Floor space		Size supply pipe, in.	Capacity per hour based on 2, 3 and 4 gals. per sq. ft. per min.			Approx. shipping weight, lbs.
				Length ft. in.	Width ft. in.		2 gals.	3 gals.	4 gals.	
55	16	4 0	1.40	4 2	2 6	1	165	250	335	1700
66	20	4 0	2.18	4 6	2 10	1	260	390	520	2800
77	24	4 6	3.14	4 10	3 2	1½	375	565	750	4200

SCAIFE VERTICAL, TANDEM, STEEL QUARTZ PRESSURE FILTERS

Cat. No.	2 units, diam. of unit, in.	Total filter area (2 filters), sq. ft.	Floor space		Height, ft. in.	Capacity per hour based on 2, 3 and 4 gals. per sq. ft. per min.			Capacity per 24 hours			Approx. shipping weight, lbs.	Weight when full of water, lbs.	Pipe sizes, in.		
			Length, ft.	Width, ft. in.		2 gals.	3 gals.	4 gals.	2 gals.	3 gals.	4 gals.			Inlet	Outlet	Sewer
88	30	9.8	7	4 6	6 6	1180	1770	2360	28320	42480	56640	6000	10800	3	3	3
99	36	14.1	8	5 0	6 6	1680	2520	3360	40320	60480	80640	7800	14800	3	3	3
100	42	19.2	9	5 8	7 4	2300	3450	4600	55200	82800	110400	10500	20500	4	4	4
111	48	25.1	10	6 2	7 4	3000	4500	6000	72000	108000	144000	12400	25400	4	4	4
122	54	31.8	11	6 8	7 4	3800	5700	7600	91200	136800	182400	16300	33000	4	4	4
133	60	39.2	12	7 2	7 6	4700	7050	9400	112800	169200	225600	19400	40000	4	4	4
155	72	56.4	14	8 3	8 0	6760	10140	13520	162240	243360	324480	27200	56800	6	6	6
177	84	76.8	16	9 3	8 0	9200	13800	18400	220800	331200	441600	36000	76400	6	6	6
199	96	100.4	18	10 4	8 0	12040	18060	24080	288960	433440	577920	42100	94800	6	6	6

Tandem Patented Steel Quartz Pressure Filters

Furnished either in single units or in pairs. When operated in pairs they are connected tandem so that each filter is cleaned with filtered water, one filter furnishing the water for cleaning the other. They are equipped with efficient strainers of special form to insure thorough washing by reversing the flow of water. Built for any required working pressure and with filtering material varied to meet any special requirement.

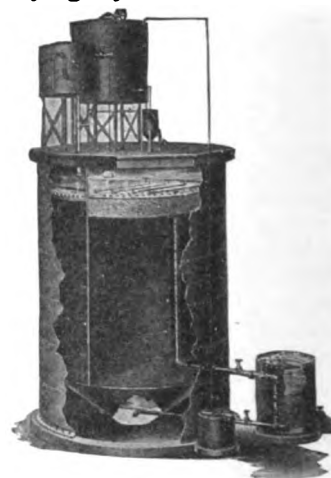


TANDEM STEEL QUARTZ PRESSURE FILTERS

Water Softening and Purifying Systems

The siphon continuous system is an automatic system not dependent upon moving mechanical devices for reagent introduction. The water enters the receiving tank, to which is connected a siphon and to the long leg of which smaller siphons connect from the solution tanks. Reagents introduced during the period of siphon discharge. This system can be modified to meet special conditions.

In addition to this type of apparatus 3 other standard continuous systems are built; also the We-Fu-Go intermittent softening and filtering system, and special systems are designed where required. Water softening and purifying apparatus must be designed to meet the particular water supply and operating conditions of each case. Estimates submitted when full data is supplied.



SIPHON CONTINUOUS WATER SOFTENING SYSTEM

WAYNE TANK AND PUMP CO.

Rapid-Rate Water Softening Systems

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FORT WAYNE, IND.

CABLE ADDRESS
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TORONTO, ONT., CAN., CANADIAN TANK & PUMP COMPANY, LTD., 119 Adelaide St.

Products

WAYNE BASE EXCHANGE WATER SOFTENERS.

Also manufacturers of Wayne Pressure Sand Filters.

For Oil and Gasoline Storage Systems, etc., see pages 691-693.

Wayne Base Exchange Water Softeners

Description—The Wayne water softening system consists of a steel pressure container filled with "Wayneite" base exchange mineral through which hard water is passed during the softening period.

The Wayne system is built in both single and double unit types of either vertical or horizontal design. Low headroom and small space are required. Capacities are sufficient for any requirements large or small.

The softening action is almost instantaneous, permitting of extremely high rates of soft water delivery. This gives flexibility of soft water supply capable of meeting sudden large demands, minimizing storage.

The Wayne has been termed the "Rapid Rate" system.

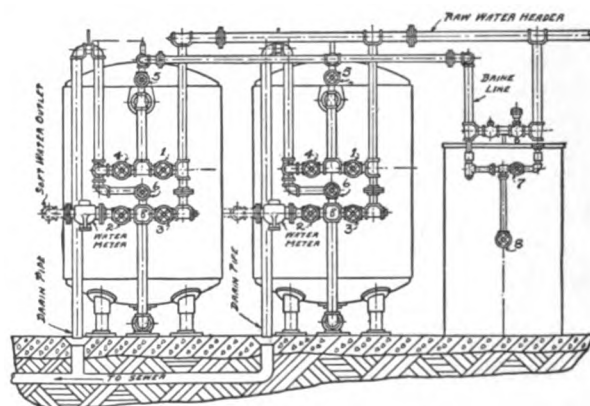
Operation—The operation of the Wayne system is extremely simple and requires only five minutes of the operator's time and attention. The quick reconditioning of "Wayneite" restores the system to service in about twenty-five minutes. This is accomplished with common salt brine which is delivered to the softener units, which takes about three minutes. The brine is then automatically flushed out of the softener with fresh water.

Advantages—The Wayne system is furnished complete from inlet to outlet with all necessary control valves and recording meter with alarm.

The salt storage tank holds a charge sufficient for

Wayne
WATER SOFTENING SYSTEMS

several days supply of soft water, obviating the necessity of handling salt each time the system is reconditioned. Weighing the salt is also done away with by means of a volumetric brine measurement.



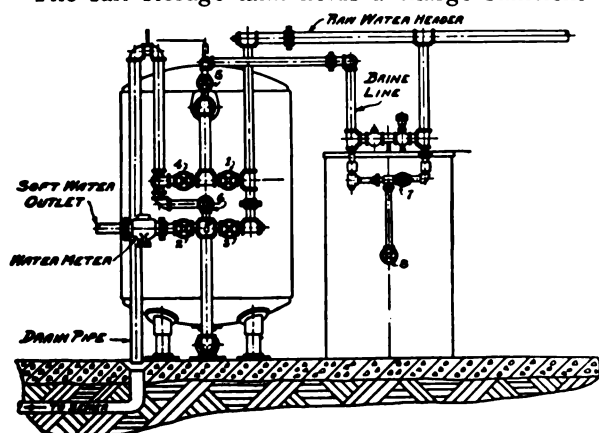
DOUBLE UNIT WAYNE WATER SOFTENER
Vertical Pressure Type

Guarantee

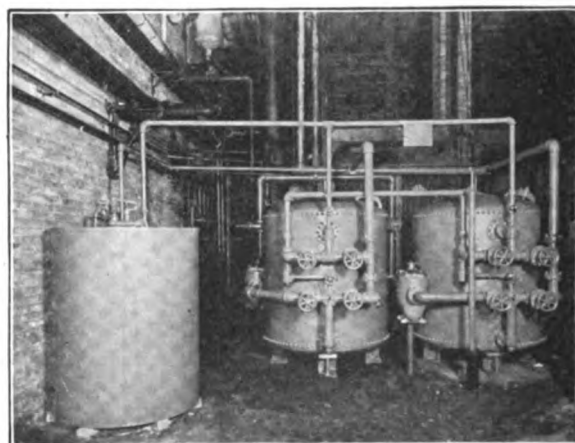
Wayne Water Softening Systems are guaranteed to be built and installed to give complete satisfaction.

Bulletins—The following bulletins explain both the application of the Wayne system and the use of soft water for special industrial purposes:

For steam power plants, SEB=785
For hotels, SEH=785
For hospitals and similar institutions, SEI=785
For laundries, SEL=785
For textile mills, SET=785



SINGLE UNIT WAYNE WATER SOFTENER
Vertical Pressure Type



TYPICAL WAYNE INSTALLATION FOR A CENTRAL POWER PLANT

WALLACE & TIERNAN CO., INC.

Chlorine Control Apparatus for Water and Sewage Purification, Swimming Pool Sterilization, Bleaching, Deodorization, and Industrial Work

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TORONTO, CAN., WALLACE & TIERNAN, LTD.

Products

CHLORINE CONTROL APPARATUS and APPLIANCES for water and sewage purification.

Processes and Apparatus for bleaching paper, textiles, and shellac; for chemical processes; for mineral separations; deodorization, etc.

Discoverers and manufacturers of the "Agene Process" for maturing flour.

Chlorine Solution Injectors and Pumps, Special Automatic Valves for application of chemical solutions, Valves, Gauges, etc., for corrosive gases and solutions.

Compressed Gas Cylinder Valves.

Apparatus to manufacture Dakin's Hypochlorite Solution from Liquid Chlorine.

Special Apparatus to apply, control, measure, and proportion gases.

Portable Bacteriological Testing Apparatus, Air-sampling Devices.

Portable Motor Truck Mounted, Water Purification and Laboratory Equipment.

Special Equipment for sterilizing outdoor swimming pools, beaches, etc.

General Use

W&T chlorine control apparatus and appliances are used to introduce liquid chlorine into water or sewage to effect bacteriological purification and destroy typhoid and all other water-borne disease germs. Used extensively by municipalities, swimming pools and by industrial plants. Also used for bleaching paper and textiles, for maturing flour, chemical processes, oxidation, deodorization, etc.

About Chlorine

Pure chlorine compressed in cylinders is now recognized as the most efficient sterilizing agent for water and sewage. In its liquid state it replaces chloride of lime so largely used in the past for this purpose.

Liquid chlorine has come into general use in these fields through the development by this company of



TRADE-MARK

suitable apparatus for its control and application.

There are now thousands of installations of W&T apparatus treating water supplies, ranging from a few thousand gallons per day up to installations with a total capacity of one billion gallons daily, as installed by WALLACE & TIERNAN Co., INC., for cities such as New York, Chicago, Philadelphia, etc.

Types and Capacities of Equipment

There are 20 different types of W&T equipment, with capacities ranging from 1/100 lb. of chlorine per day, upwards. Either manual or automatic equipment is available.

Operation and Cost

Liquid chlorine, when controlled by W&T equipment becomes so efficient that the water supply of any city or town can be protected against water-borne diseases at a cost of from 17c to 50c per million gals.

Sewage and Trade Wastes

Liquid chlorine is used extensively in the sterilization of sewage and trade wastes. It is particularly recommended where sewage is discharged into streams used as water supplies or for bathing.

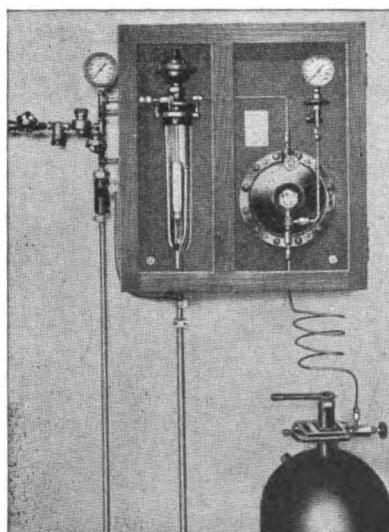
Liquid chlorine is the most effective sterilizing agent for tannery wastes, where the destruction of specific organisms, such as the anthrax spore, is required by law.

Liquid chlorine controlled by W&T equipment is applicable to any problem of sterilization or disinfection, bleaching or industrial use.

Quotations and recommendations on equipment will be made on receipt of details. Send for information blank.

Literature

A full set of technical publications describing the various phases of chlorination and W&T equipment is available, and will be sent on request.



W&T MANUAL CONTROL CHLORINATOR
Solution Feed Type MSA

"AUTOMATIC" SPRINKLER COMPANY OF AMERICA

Contractors for Fire Prevention

123 William Street
NEW YORK, N. Y.

PLANT
YOUNGSTOWN, OHIO

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MINNEAPOLIS, MINN., 550-52 McKnight Building
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PHILADELPHIA, PA., 328 Chestnut Street
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YOUNGSTOWN, OHIO, Brittain Street

"AUTOMATIC" SPRINKLER CO. OF CANADA, LTD.

MONTREAL, QUE., 24 Victoria Square

TORONTO, ONT., 70 Lombard Street

Products

"AUTOMATIC" FIRE EXTINGUISHING EQUIPMENTS, including Standard Sprinkler Apparatus, Wet and Dry Pipe; also Protection against Special Hazards, such as powder manufacturing, pyroxyline products, varnish dip tanks, oil and grease fires: Automatic Draft Stops; Automatic Water Curtains; Automatic Drainage of Hazardous Liquids; Automatic Fuel Oil Stops; Automatic Chemical Equipments for Supplying Automatic Sprinklers and Hose Standpipes Independent of Water Supplies; Sprinkler Heads, Dry Valves; Alarms, water and electric; Automatic Fire Door Releases; Deluge Valves; Sprinkler Systems, and all auxiliaries to complete systems of protection on ordinary and unusual fire hazards.



Underwriters' Laboratories, Inc., and accepted by the National Board of Fire Underwriters and every insurance association and company in the United States and Canada, with consequent reduction of insurance.

The Most Efficient Fire Fighters Known

"Automatic" sprinkler systems embody the scientific supply and distribution of water immediately and automatically a fire occurs. They make the spreading of fire impossible—they do not prevent fires, but extinguish them with minimum loss.

Besides reducing fire losses, they considerably reduce the cost of insurance and the risk of delay and loss of business resulting from fire.

"Automatic" Service

This company is the largest organization specializing in fire protection. Its large volume of business and efficient organization make for economy on any individual installation, yet first cost is not lowered at the expense of the service expected or of the protection acquired.

The actual basis on which fire protection can be acquired must necessarily vary according to the conditions bearing upon each case. Without expense or obligation on your part, this company will make a survey of the situation and report explicitly.

We maintain a complete inspection service in many locations with competent repair men available at any time, skilled inspectors and technical advisers.

Official Approval

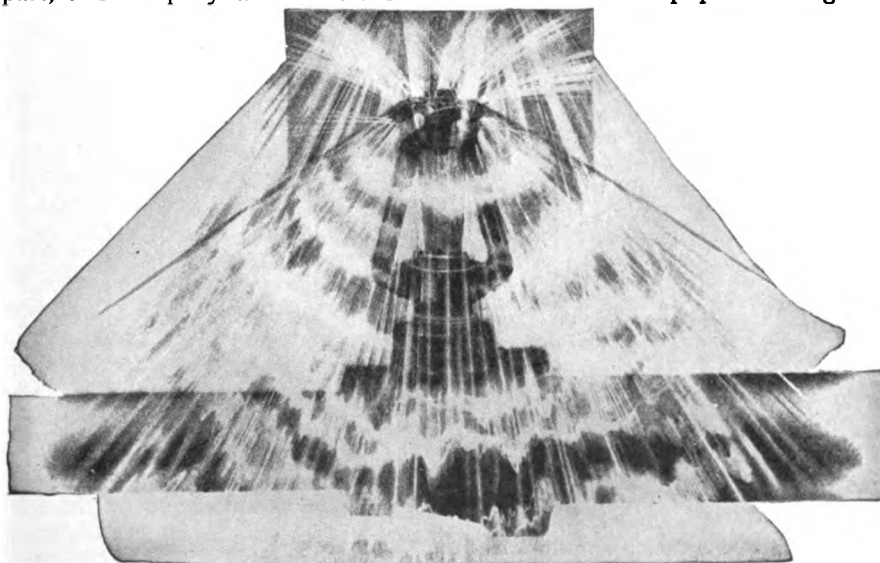
"Automatic" sprinkler apparatus has been tested and approved by the

Sprinkler Heads

Sprinkler heads are considered to be the most thorough fire fighting device. A fire seldom opens more than a few—85% of all fires in sprinklered buildings have been controlled by 5 heads or less. We have installed the largest equipments in the country, one plant alone requiring 120,000 sprinkler heads.

We Do Nothing But Specialize in Fire Protection

Our sole aim is to afford customers the highest possible character of equipment designed to automatically and positively control fire. It is an utter impossibility to eradicate the occurrence of fire, but the little fire can be kept little—automatically, positively. We do nothing but specialize in fire protection—create, manufacture and install equipments which assure the automatic control of fire under whatever conditions that may exist.



"AUTOMATIC" SPRINKLER HEAD IN OPERATION

GRINNELL COMPANY, INC.

Manufacturers of Fire Protection Systems

EXECUTIVE OFFICES
PROVIDENCE, R. I.

NEW YORK, N. Y.
PROVIDENCE, R. I. (Plant)
BUFFALO, N. Y.
MINNEAPOLIS, MINN.
COLUMBUS, OHIO
BOSTON, MASS.
HARTFORD, CONN.
ALBANY, N. Y.
DALLAS, TEX.

ST. PAUL, MINN.
ATLANTA, GA. (Plant)
PHILADELPHIA, PA. (Plant)
CINCINNATI, OHIO
CLEVELAND, OHIO
NORTH CHARLOTTE, N. C. (Plant)
AUBURN, R. I. (Plant)
BALTIMORE, MD.

CHICAGO, ILL. (Plant)
ST. LOUIS, MO.
DETROIT, MICH.
NEW ORLEANS, LA.
ROCHESTER, N. Y.
MILWAUKEE, WIS.
KANSAS CITY, MO.
WARREN, OHIO (Plant)
GREENVILLE, S. C.

GRINNELL COMPANY OF THE PACIFIC

LOS ANGELES, CAL.

SAN FRANCISCO, CAL.

SEATTLE, WASH.

GRINNELL COMPANY OF CANADA, LTD.

MONTREAL, QUE. (Plant)

TORONTO, ONT. (Plant)

VANCOUVER, B. C.

WINNIPEG, MAN.

Products

GRINNELL SYSTEMS of AUTOMATIC FIRE PROTECTION and AUTOMATIC FIRE ALARM.

For Power Piping, Heating and Industrial Piping Equipments, see pages 392-394.

Grinnell Automatic Sprinkler System

This system has been in successful operation for more than 40 years.

Today over 20,000,000 Grinnell sprinkler heads are safeguarding business property valued at approximately three billion dollars. The average loss per fire in Grinnell protected buildings in over 22,000 recorded fires is less than \$300.00—a reduction of over 96% on the lowest average fire loss previous to the invention of this system.



SPRINKLER HEAD

Operation

When fire breaks out, temperature at the ceiling rapidly increases and causes the fusible strut of the sprinkler head to melt. Thereupon, the glass valve, found only in the Grinnell head, is instantly thrown from its seat on the unique flexible diaphragm. This allows the water to rush out and strike the deflector, which breaks it into a heavy spray. One sprinkler head effectively drenches an area of 80 to 100 sq. ft.

The operation of the sprinkler head immediately and automatically gives the fire alarm, a water motor alarm being usually installed on the outside of the building.

Connections and Piping

An ample supply of water is furnished, either from tanks, a fire pump or a connection with city water, or a combination of two or more of these units. Often city water alone is sufficient.

From this abundant source of water a large riser or supply pipe extends from the top to the bottom of the building to be protected. Connected with this large pipe are branch lines of smaller pipe. These run near the ceiling to all parts of the building. They are carefully graded in size in order that the water everywhere

throughout the building may be under good pressure and ample in volume. At stated intervals along these branch lines (usually 8 to 10 ft.) are placed Grinnell automatic sprinkler heads.

Grinnell Dry Pipe System

To obviate freezing in the sprinkler piping in buildings which are unheated, GRINNELL COMPANY, INC., installs a dry pipe system. In this system the water is held back of any point where it might freeze by the Grinnell dry pipe valve. The pipes in this system are filled with air under moderate pressure, but when a sprinkler head opens, the air escapes and the dry valve operates, admitting water to the system.

The system is further improved by the Grinnell Dry Valve Accelerator, an important invention which makes dry pipe systems practically as quick in operation as wet ones.

Installation

Grinnell Automatic Sprinkler Systems are factory-assembled to blue prints, fittings being made-on as far as possible by machinery. The result is that the equipment comes to the job ready for quick and effortless installation by our highly trained erecting crews. This reduces interference with usual plant operation to a minimum.

Inspection and Service

This company has instituted a new department whose sole duty it is to inspect Grinnell sprinkler equipments and render full reports to the owners on such inspections with practical suggestions for needed changes. A corps of expert sprinkler engineers is engaged in this work and the success with which it has already been attended is ample evidence of the necessity of this independent inspection service.

The sole aim of this inspection work is to maintain Grinnell equipments in the same first class operative condition that they were in when originally installed. For that reason this service is rendered on a low yearly fee basis which is practically cost.

Designs and Estimates

Inquiries addressed to the head office of GRINNELL COMPANY, INC., or to any of the branches will immediately receive the attention of the engineering staff, who will promptly furnish expert advice with designs or estimates as required.

BADGER FIRE EXTINGUISHER CO., INC.

CABLE ADDRESS
"BADGEREX"

175 Portland Street
BOSTON, MASS.

CODE USED
WESTERN UNION

BRANCH OFFICES

NEW YORK, N. Y., 123 William Street

SAN FRANCISCO, CAL., 424-440 Howard Street

Products

BADGER'S CHEMICAL HAND FIRE EXTINGUISHERS;
BADGER'S CHEMICAL FIRE ENGINES (hand-drawn).
For Badger's Expansion Joints, see page 573.

Requirements of an Efficient Fire Extinguisher

Fire extinguishers are never used except in an emergency. Regardless of the lapse of time, everything about them must be in perfect operating condition. Cheap extinguishers can be built, but only by the sacrifice of quality. Badger's extinguishers are built honestly, priced fairly, and assure you of the best fire protection it is possible to secure.



Badger's No. 1 Carbon Tetrachloride Extinguisher

Pump type for special protection against automobile, motor boat, electrical and highly inflammable liquid fires, where water is not effective. Will not freeze at 50° below zero.

PRICE LIST

1 - quart size	\$10.00
1 1/4 - quart size	12.00
1 1/2 - quart size	14.00

Write for discounts

1-QT.
PUMP
TYPE

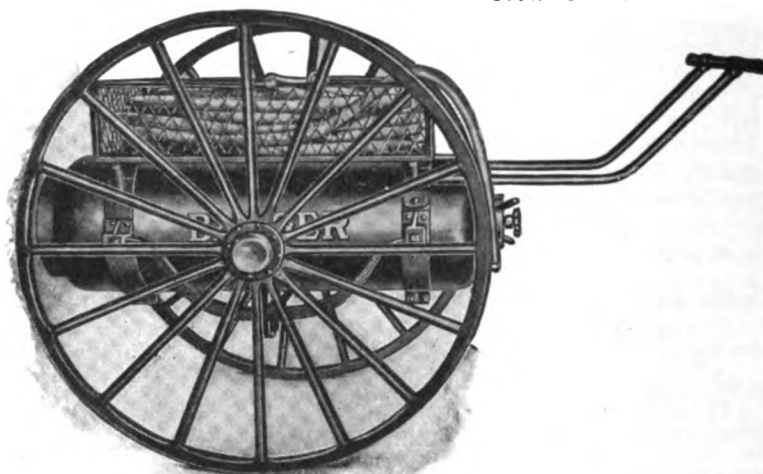
Badger's 40-gallon Truck Engine

This engine may properly be termed "A One Man Fire Department." A valve in the cover controls the acid supply so that it can be pulled any distance to the scene of fire. Comes complete with 50 ft. of hose and brass shut-off nozzle. Made with either sheet lead lined steel tank, or with a galvanized steel tank.

PRICE LIST

Sheet lead lined steel tank.....	\$325.00
Galvanized steel tank.....	275.00

Write for discounts



TRUCK TYPE

Badger's 40-gallon Warehouse Engine

This chemical engine was designed especially for indoor use. Made narrow so that it will pass through an ordinary door. Automatic in action. Comes complete with 50 ft. of hose and brass shut-off nozzle. Throws powerful chemical stream 75 ft. Made with either sheet lead lined steel tank, or with galvanized steel tank.

PRICE LIST

Sheet lead lined tank....	\$300.00
Galvanized lined tank....	250.00

Write for discounts

Badger's 3-gallon Hand Extinguishers

Soda and acid type. Body made of solid copper, cover of solid brass. Inside heavily tinned to protect from corrosion. Removable inside parts made of non-corrosive metals. Nothing to get out of order. A thoroughly dependable, expertly made, fire extinguisher. This type is for general protection in all public buildings, factories, warehouses, etc.

\$18.00 each

Write for discounts

Underwriters' Approval

Badger's products are approved by the Underwriter's Laboratories, Inc.



3-GALLON HAND
EXTINGUISHER
For general use



WAREHOUSE TYPE ENGINE
For indoor use

JAMES M. CASTLE, INC.

Fire Extinguishing Appliances

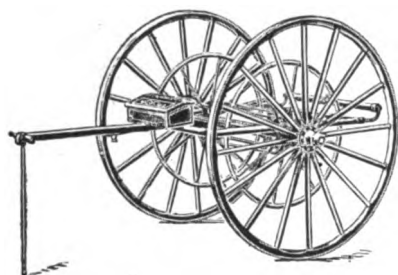
PHILADELPHIA, PA.

Products

FACTORY HOSE CARTS; WAREHOUSE AND OUTSIDE OF YARD TYPES OF CHEMICAL ENGINES; FIRE EXTINGUISHERS; LIQUID for Refilling Fire Extinguishers.

Castle Factory Hose Cart

In use all over the country and acknowledged superior.



FACTORY HOSE CART

be equipped with axe and crowbar in holders if desired. Neatly painted.

Castle carts come in sizes all tested for capacity. Hose varies in weight according to the factory practice of hose manufacturer, making it impossible to give accurate dimensions for all brands. Our capacities are guaranteed.

Further particulars and Hose Cart Catalogue sent on request.

Castle Forty-gallon Warehouse Type Underwriters' Approved and Labeled Chemical Engine

For use inside factories, stores, garages, piers, warehouses, etc.

Specifications—Tank—Annealed open hearth steel, tensile strength 55,000 lbs. Coated inside and out with pure zinc by hot galvanizing process. Total capacity 40 gals. Tank and fittings tested to 350 lbs.

Wheels—Sarven pattern. 50 in. in diameter over wood.

Stoppie Operating Mechanism—Of brass. Stem passes through stuffing box in cap and is provided with triple threads for quick opening.

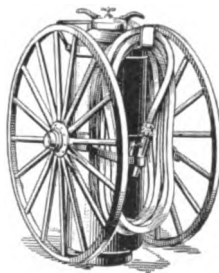
Hose—50 ft. of 4-ply best quality red rubber chemical hose. Tested to 400 lbs. pressure.

Nozzle—Compression type; discharge orifice $\frac{1}{4}$ in. in diameter. Brass.

Chemical Charge—Special grade chemicals.

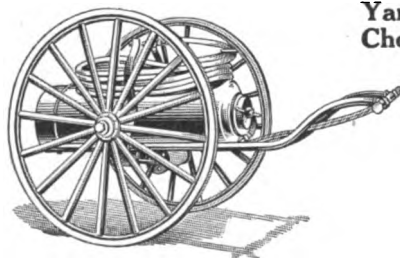
Dimensions—Tread 27 in.; width over all, approximately, 30 in.; height, 56 in.; space occupied when not in use, 50x30 in.

Weights—Empty, 350 lbs.; charged, 650 lbs.



WAREHOUSE TYPE CHEMICAL ENGINE

Castle Forty-gallon Outside or Yard Service Type Chemical Engine



OUTSIDE TYPE CHEMICAL ENGINE

Specifications—Same as Warehouse type of engine except as follows:

For fires outside of buildings or for fires within buildings which can be attacked from the outside. Labelled by Underwriters' Laboratories, Inc.

Running Gear—Made of $1\frac{1}{2}$ -in. iron pipe. Provided with 40 ft. of $\frac{1}{2}$ -in. manila rope with reel.

Dimensions—Tread, 40 in.; width over all, 46 in.

Weights—Empty, 465 lbs.; charged, 770 lbs.

Castle Liberty No. 1 Extinguisher

A 3-gal. hand pump, liquid gas, carbon tetrachloride type fire extinguisher.

Specifications—Tank—Made of galvanized steel, seams crimped and soldered. Each tank is carefully tested after each operation to insure absolute tightness. No solder is used in interior construction, lessening possibility of corrosion.



LIBERTY No. 1 EXTINGUISHER

Pump—Double acting with heavy bronze ball valves in plunger and in foot valve, held in specially designed cages. The hollow plunger rod serves as an air chamber, thus making possible a steady stream from the discharge. All pump parts in contact with the liquid are brass. All moving parts may be taken out for inspection or repair by unscrewing the pump head casting.

The extinguishing agent is Castle Liquid.

At a public test in Baltimore one Castle Liberty No. 1 controlled a fire that could not be controlled by 28 ordinary 1-qt. extinguishers. At a cost of 5 ordinary 1-qt. extinguishers it did more than the work of 28. One man did the work of nine.

Castle Fire Guard

Labelled by the Underwriters Laboratories, Inc. Recommended by all rating bureaus. Only extinguisher that is approved by the Pennsylvania State Department of Labor and Industry.

Specifications—Tank—Cold rolled Lake Superior copper. Longitudinal seam riveted, sweated, and floated with solder. Head and bottom formed by stamping. Head riveted to shell and joint sweated and floated with solder. Interior heavily and evenly coated with lead-tin alloy. Total capacity 3 gals. Tank and fittings tested to 350 lbs. water pressure.

Cap—Brass casting. Rubber gasket $\frac{3}{8}$ in. thick, set in recess to protect threads from chemicals.

Discharge Elbow—Brass casting tinned and protected by tinned copper strainer.

Acid Bottle—Round glass with flanged neck, retained in brass wire cage attached to under surface of cap.

Bottom Handle—Galvanized iron riveted to bottom of tank.

Side Handle—Malleable iron and riveted to tank. Furnished with hanging screws and hook.

Hose—Best quality $\frac{3}{8}$ in. Hose can be detached and replaced without injury to couplings or nozzle.

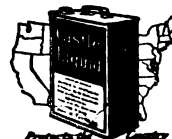
Chemical Charge—Special grade chemicals.



FIRE GUARD

Castle Liquid

For refilling any 1-qt. extinguisher of the carbon tetrachloride type. Used by leading corporations, public utilities and National, State and City Governments. It is the only liquid that is recommended for all makes of carbon tetrachloride extinguishers. Has a chemically pure carbon tetrachloride base and contains no chloroform. Is non-corrosive and puts out more fire. Use Castle Liquid in your 1-qt. extinguishers—increase their efficiency and decrease maintenance expense.



CAN OF CASTLE LIQUID

ESTABLISHED 1892

THE SAFETY FIRE EXTINGUISHER CO.

Manufacturers of Approved Fire Extinguishing Appliances
291-293 Seventh Avenue
NEW YORK, N. Y.

Products

APPROVED FIRE EXTINGUISHING APPARATUS, including the Safety Fire Bucket Tank, Safety Fire Extinguisher, Chemical Engines, Underwriters' Fire Hose, Safety Folding Pails, Racks and Reels.

Also manufacturers of Hose Carts, Hose Cabinets, Hose and Hydrant Houses, Valves, Axes, Hooks, Watchman's Clocks, Waste Cans.

Safety Fire Bucket Tank

Indorsed and listed by the Underwriters' Laboratories, Inc., No. 249, and approved by National Board of Fire Underwriters and Board of Supervising Inspectors of Steamboat Inspection Bureau.

Always ready for immediate use and requires no attention. Solution does not evaporate, foul or freeze in any temperature.

Body of heavy steel, top and bottom reinforced with wrought iron rim. Cover and bottom stamped out of one piece, hinges and hasps malleable iron, and entire tank and buckets galvanized after being made. Cover closes on rubber packing, making tank practically airtight and preventing evaporation.

So simple to operate a tank that a child can use it effectively. Open cover, and top bucket is full with handle up, contents of which should be thrown at the base of fire. As fast as one bucket is removed the next fills and handle rises automatically. Six men can each remove a bucket and use its contents on a fire and 4 of the buckets can be refilled with solution remaining in tank.



Plate No. 1-S
Exterior View

Plate No. 3-S
Sectional View

SAFETY FIRE BUCKET TANK

SIZES
No. 1. Height, 29 in.; diameter, 15½ in. Contains 25 gals. chemical solution and six 10-qt. buckets.
No. 2. Height, 31 in.; diameter, 18½ in. Contains 40 gals. chemical solution and six 14-qt. buckets.

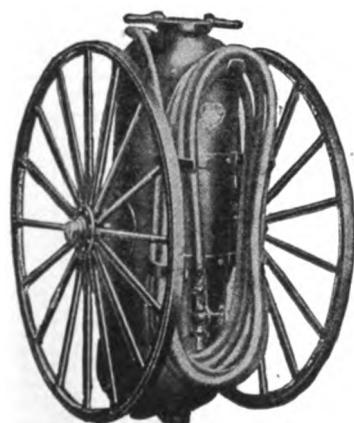


Plate No. 76-S
TYPE AA SAFETY CHEMICAL
ENGINE

Safety Chemical Engines

For factory, mercantile and suburban use. Horizontal and perpendicular types. Made with one or two tanks.

Capacities of single tank engines: 20, 40 and 45 gals.; double tank engines: two 35-gal. tanks.

Catalogue gives full description, sizes and use.

Safety Fire Extinguisher

Regularly labeled and tested under the supervision of Underwriters' Laboratories, Inc.

Also approved by Board of Supervising Inspectors of Steamboat Inspection Bureau and all boards of fire underwriters.

Capacity, 3 gals.

Tank is made of extra heavy Lake Superior cold rolled copper; body No. 18 gage; head and bottom No. 17 gage. Outside is highly polished and attractive in appearance; inside is thoroughly coated with a special preparation of lead to prevent corrosion of copper. Every machine is subjected to a hydrostatic pressure of 400 lbs. to the sq. in. before leaving the factory, and so guaranteed.



SAFETY FIRE
EXTINGUISHER

Safety One-quart Fire Extinguisher

Liquid gas extinguisher. Approved and labeled under the directions of Underwriters' Laboratories, Inc. For use on gasoline, electrical and carbon fires.

Recharges always on hand for prompt shipment.

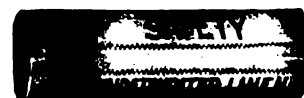
Underwriters' Labeled Fire Hose and Other Products

Pure linen, unlined fire hose and cotton, rubber lined fire hose. Sizes: 1, 1½, 2, 2½ in.

Couplings, nozzles, hose racks and reels, hose cabinets, valves, hose carts, hose and hydrant houses and equipments.



Plate No. 401-S
SAFETY ONE-
QUART FIRE
EXTINGUISHER



SAFETY FIRE HOSE

Safety Folding Pails

Collapsible, of spring steel frame and canvas body. For use in railroad coaches, etc.

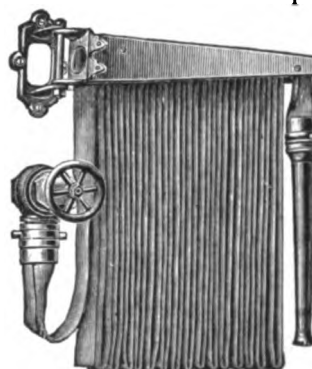


Plate No. 300-S
SAFETY APPROVED HOSE RACK
Catalogues



Plate No. 465-S
SAFETY FOLDING PAILS

Catalogues describing our products more fully will be sent on request.

RUUD MANUFACTURING CO.

Manufacturers of Gas Fired Water Heaters

GENERAL OFFICES
PITTSBURGH, PA.

FACTORIES
PITTSBURGH, PA.

TORONTO, CAN.

BRANCH OFFICES

ATLANTA, GA.
BALTIMORE, MD.
BOSTON, MASS.
BUFFALO, N. Y.
CHICAGO, ILL.
CINCINNATI, OHIO

CLEVELAND, OHIO
COLUMBUS, OHIO
DALLAS, TEX.
DAYTON, OHIO
DETROIT, MICH.
DULUTH, MINN.

INDIANAPOLIS, IND.
JACKSONVILLE, FLA.
KANSAS CITY, MO.
LOS ANGELES, CAL.
LOUISVILLE, KY.
MILWAUKEE, WIS.

MINNEAPOLIS, MINN.
NEW YORK, N. Y.
OKLAHOMA CITY, OKLA.
PHILADELPHIA, PA.
PORTLAND, ORE.
ROCHESTER, N. Y.

ST. LOUIS, MO.
SAN FRANCISCO, CAL.
SYRACUSE, N. Y.
TOLEDO, OHIO
TORONTO, CAN.
WASHINGTON, D. C.

Products

INSTANTANEOUS AUTOMATIC GAS WATER HEATERS.

AUTOMATIC STORAGE GAS WATER HEATER SYSTEMS.

GAS TANK WATER HEATERS.

Hot Water Demands Met by Ruud Water Heaters

Wherever hot water is needed, a Ruud gas fired water heater can supply it. The Ruud meets all requirements, large or small, in factories, residences, industrial plants and mines for supplying hot water in washrooms,

shower baths, first aid rooms, garages, etc., for general manufacturing purposes and for industrial housing projects.

Ruud Instantaneous Automatic Gas Water Heaters

This type heats the water as it is used (no hot water being held in storage). It is unlimited in supply but limited to rate of flow.

Ruud instantaneous gas water heaters are made in two types, the Standard and the Cottage. The Standard (cast iron shell) is suitable for use where the demand does not exceed 8 gals. per minute, the Cottage (cast iron or aluminum shell) for use where the demand does not exceed 2½ gals. per minute.

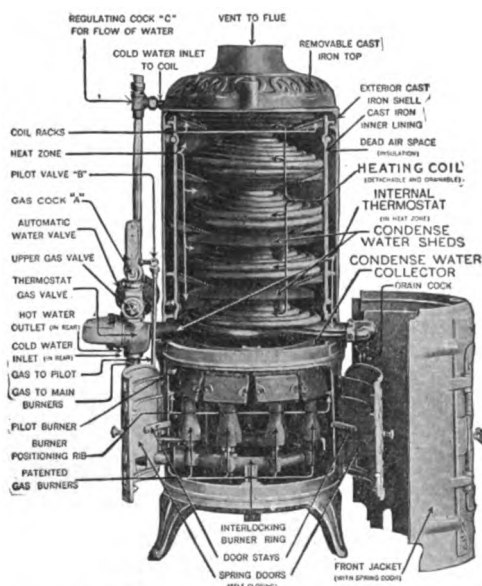
Operation—Operation is automatic, the gas being turned on or off in response to the opening or closing of the hot water faucets.

The Ruud internal thermostat affords a secondary but absolute regulation of the gas in accordance with the temperature of the water by a gas valve entirely separate from that operated by the water flow. Besides delivering the water at a uniform set temperature, which may be any degree desired, this device gives great economy in gas consumption, prevents overheating of the water and insures absolute safety.

Installation—A Ruud water heater can be installed by any competent plumber and in any place having suitable gas supply (artificial, natural or gasoline gas) and where at least 5 lbs. of water pressure is available at highest fixture.



RUUD AUTOMATIC COTTAGE WATER HEATER

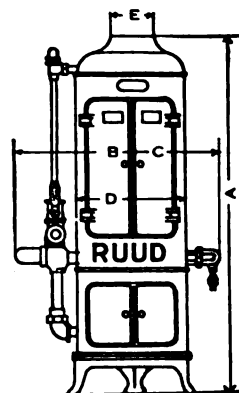


ANALYTICAL VIEW OF RUUD STANDARD WATER HEATER

GENERAL TABLE, RUUD STANDARD INSTANTANEOUS AUTOMATIC AND COTTAGE WATER HEATERS
(Thermal Valve or Type F Model—Natural or Artificial Gas)

Size in.	Capacity per min., gals.	Heater dimensions, in.					Avg. temp. rise, deg. Fahr.		Water inlet, in.	Water outlet, in.	Min. water pressure, lbs.	Size gas meter	Gas consumed per min., cu. ft.	Gas line, in.	Flue conn., in.	Net weight, lbs.
		A	B	C	D	E	Nat. gas	Art. gas								
COTTAGE WATER HEATERS																
1½	1½	32½	12	9	11	4	80	63	¾	¾	20	10-L	1½	¾	4	120
2½	2½	38½	12	9	12½	4	80	63	¾	¾	20	10-L	2½	¾	4	175
60	1½	30¾	12	9	11¾	3	80	63	¾	¾	20	10-L	2	¾	4	60
70	2½	33	12	9	12¾	4	80	63	¾	¾	20	10-L	2½	¾	4	70
STANDARD INSTANTANEOUS WATER HEATERS																
3	3	45½	14¾	11	14½	6	80	63	1½	1½	25	30-L	3	1	6	270
4	4	47¾	15½	12	16¾	6	80	63	1½	1½	25	45-L	4	1¼	6	330
6	6	55½	17¼	13¾	19	7	80	63	1	¾	25	60-L	6	1½	7	475
8	8	58½	18¾	14	21¼	8	80	63	1	1	25	80-L	8	2	8	575

NOTE—Sizes Nos. 4, 6 and 8 heaters are also built for operating where water pressure is less than 25 lbs. at highest faucet. For these conditions, specify "Low Pressure" heaters.



DIMENSION DIAGRAM

Ruud Tank Water Heaters

Ruud tank heaters, as shown in illustration, are furnished in two sizes: Nos. 25 and 35. They are non-automatic. Are used to a great extent in industrial housing projects.

Full particulars on request.

**Ruud Automatic Storage Systems**

Build up and maintain a storage of hot water and, therefore, are limited in supply but unlimited in rate of flow.

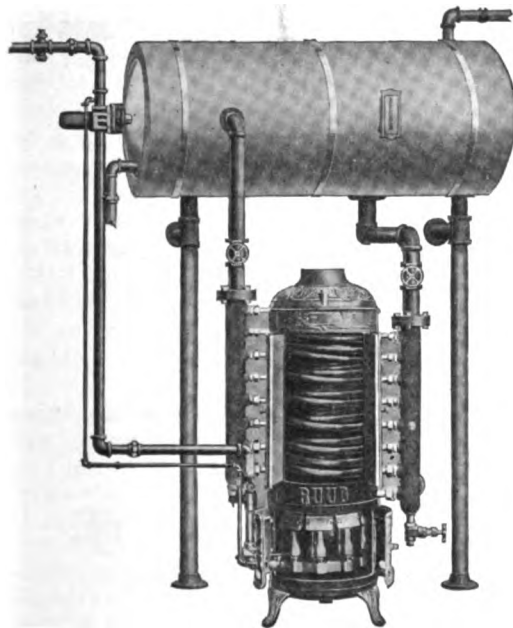
Ruud Automatic Multicoil Storage System—

Designed to supply the demand for hot water in large quantities and to fulfil severe requirements frequently met in industrial plants, residences, etc., and, in general, any building where need for hot water and the conditions surrounding the installation are more than ordinarily exacting.

System is entirely automatic, operating without any attention. Principle of operation is the maintenance in a storage tank of sufficient hot water at a predetermined temperature to supply anticipated demands.

After starting system, heater will operate continuously until tank is filled with hot water up to a temperature at which thermostat is adjusted—usually 140° Fahr., after which burners will light up intermittently or as often as is necessary to keep water in tank at this temperature.

The famous Ruud all-metal thermostatic moment valve is the controlling mechanism for artificial gas installation. Ruud graduating thermostat is supplied where natural gas is used.



RUUD MULTICOIL STORAGE SYSTEM (AUTOMATIC)

GENERAL TABLE, RUUD MULTICOIL STORAGE HEATERS

Size	Height of heater, in.	Width of heater in.	Capacity per hour, gal.	Aver. tem. rise, deg.		Manifold connection, in.	Gas line, in.	Flue connections, in.	Moment valve required, in.	Gas consumed per hour	Size gas meter	Net weight, lbs.
				Net gas	Art. gas							
100	45	27	100	75	63	1½	¾	4	¾	120	20	233
200	49½	29½	200	75	63	2	1	6	1	210	30	333
300	53½	32	300	75	63	2½	1	8	1	300	45	410
500	64½	38½	500	75	63	2½	1½	8	1½	500	80	683

NOTE—Tanks furnished with multicoil storage systems are equipped when so ordered with galvanized iron or copper steam heating coils and handholes or manholes. No manholes can be supplied on copper tanks. Prices on application.

Ruud multicoil systems are universally suited for return circulation systems of plumbing and take but little account of water pressure.

Ruud Small Automatic Storage Systems—

Operate upon identically the same principle as the Ruud multicoil storage systems.

They automatically maintain a storage of hot water at desired degree of temperature for demands less severe than those met by the multicoil type.

Supplied with Ruud all-metal thermostatic moment valve.

Tanks are made of galvanized iron or copper, completely surrounded with granulated cork insulation held in place by an outer jacket of heavy galvanized iron.

Especially suitable for low water pressure conditions and where private water works operate.

Freedom from limitations imposed by water pressure and gas supply conditions renders these systems almost universally adaptable. Can be installed in connection with direct supply and return circulation systems.

Recommended for work where gasoline gas will be used for fuel to operate the heater.

Built as units, complete, ready to set up.



RUUD SMALL STORAGE SYSTEM

GENERAL TABLE, RUUD SMALL STORAGE SYSTEMS

Size	Tank, gal.	Gas connection to moment valve, in.	Cold water supply not less than, in.	Flue connection, in.	Size meter lights	Hot water outlet, in.	Gas supply, in.	Size circulators, in.	Height over all, in.	Depth over all, in.	Net weight, lbs.
30	20	¾	¾	¾	10	¾	¾	1	60	27½	370
40	40	¾	¾	¾	10	¾	¾	1	72	27½	430
50	66	¾	¾	¾	10	¾	¾	1½	77	33½	695

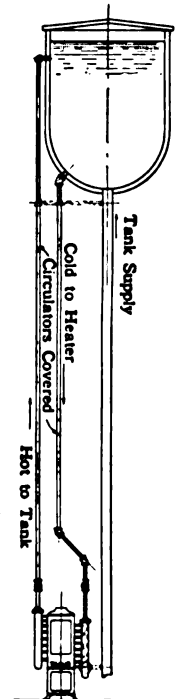
Storage Heaters Used to Prevent Freezing of Fire Tanks

The purpose of the storage heater is to furnish sufficient heat to the tank so that loss by radiation will not permit ice to form.

The heater is connected in the usual way, the hot water entering from 6 to 12 in. below the surface of the water in the tank, the return from the heater being taken over the bottom of the tank. Pipe lines should be thoroughly insulated. Hot water inlet can be split so as to enter the tank in several places if desired.

The accompanying illustration shows the manner in which the heater should be connected to prevent freezing of the supply leg.

The heater is lighted only when outside temperature is such that ice might form unless heat were added to the water in the tank.

**Engineering Advice**

Our engineering department will be glad to help you on any water heating problem.

RUUD WATER HEATER CONNECTED TO STORAGE TANK

ESTABLISHED 1878

JAMES B. CLOW & SONS

Manufacturers of Cast Iron Pipe, Plumbing and Heating Supplies;
Cast Iron Columns

TELEPHONE
WABASH 2789

534-546 South Franklin Street
CHICAGO, ILL.

SALES OFFICES

NEW YORK, N. Y.
ST. LOUIS, MO.

MILWAUKEE, WIS.
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SAN FRANCISCO, CAL.

MINNEAPOLIS, MINN.
PHILADELPHIA, PA.

WORKS

CHICAGO, ILL.

NEWCOMERSTOWN, OHIO

COSHOCTON, OHIO

Products

PIPE and FITTINGS.

CLOW "GASTEAM" RADIATORS.

ULTRA-VIOLET RAY WATER STERILIZERS.

PLUMBING SUPPLIES, including DRINKING FOUNTAINS, AUTOMATIC WATER CLOSETS, LAVATORIES, SINKS, etc.

Also Cast Iron Columns, Bases and Caps.

In Chicago, JAMES B. CLOW & SONS carry a complete line of the following material:

Steam Supplies, including Steel and Wrought Iron Pipe; Cast Iron and Malleable Fittings; Low, Standard and Extra Heavy Valves with Screwed, Flanged, Hub and Spigot Connections—Straightway, Angle, Check, Flap, etc.

Water Works Supplies, including Cast Iron Bell and Spigot, Flanged and Threaded Pipe and Fittings, Lead, Oakum, Tools, etc.

They also manufacture in Chicago Marble Products for all purposes and all brass work for their plumbing business, including Faucets, Bibbs, Traps, Supplies, Showers, etc.

At their Ohio plants, which specialize on making cast iron pipe and fittings, a complete line of Cast Iron Specialties is also produced, including:

Manholes, Lamp Posts, Fountains; Special Castings for Coke Ovens, Filtration Plants, Sugar Refineries, Chemical Companies, Oil Refineries, etc.; Radiators, Boilers; Plumbing Specialties such as Bell Traps, Drum Traps, Gratings, etc.

Steel or Wrought Iron Threaded Pipe

Can furnish random lengths of steel or wrought iron pipe in all standard sizes, either black or galvanized. Cut lengths to order.



STEEL OR WROUGHT IRON THREADED PIPE

Cast Iron Hub and Spigot Pipe

Carried in stock in sizes from 3 to 48 in.; 12-ft. lengths are regular; shorter lengths will be cut to order. This pipe is made in all classes for all pressures.



CAST IRON HUB AND SPIGOT PIPE

Cast Iron Flanged Pipe

Made in all sizes from 1 1/4 to 48 in. and in all



CAST IRON FLANGED PIPE

classes for all pressures; 12-ft. lengths are regular; shorter lengths will be cut to order.

Cast Iron Threaded Pipe

This pipe is made in all sizes from 1 1/4 to 16 in., inclusive. It is threaded at both ends the same as steel or wrought iron pipe. 12-ft. lengths are regular.



CAST IRON THREADED PIPE

Cast Iron or Malleable Screwed Fittings

A very large stock of screwed fittings in both cast iron and malleable iron, black or galvanized, straight and reducing.



CAST IRON AND MALLEABLE FITTINGS

Cast Iron Hub and Spigot Fittings

Water and gas fittings are carried in stock in all sizes from 3 to 48 in., in straight and reducing sizes. Also cutting-in specials of all kinds.



CAST IRON HUB AND SPIGOT FITTINGS

Cast Iron Flanged Fittings

A very large stock of flanged cast iron fittings in all standard sizes for low, standard and extra heavy pressures, both straight and reducing.



CAST IRON FLANGED FITTINGS

Cast Iron Threaded Fittings

A complete line of cast iron threaded fittings for use with our threaded cast iron pipe. In both straight and reducing sizes.



CAST IRON THREADED FITTINGS

Stock of Pipe and Fittings

All pipe and fittings carried in stock for all pressures. Castings for special purposes made to order.

Continued on next page

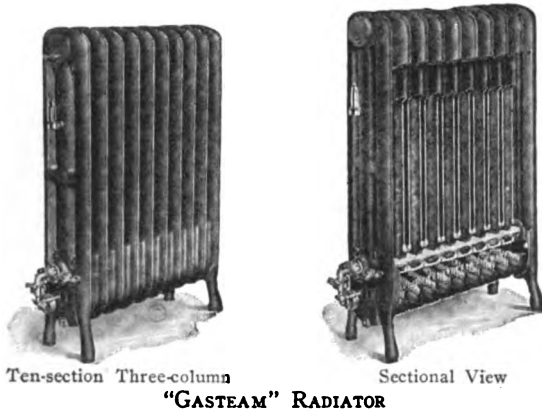
Clow "Gasteam" Radiators

These radiators provide steam heat without the expense of a boiler, piping and chimney, when and where it is wanted.

They also eliminate the disagreeable firing of a coal boiler and do away with the coal bin, dust, dirt, ashes and smoke.

"Gasteam" heating is adaptable to new or old commercial buildings, factories, stores, churches, schools, theaters and residences. In fact it is a practical and efficient heating system for every purpose.

Description of "Gasteam" Heating System—In appearance Clow "Gasteam" radiators resemble any other cast iron steam radiator. In place of a boiler, however, each radiator is connected to a gas pipe and



Ten-section Three-column

Sectional View

"GASTEAM" RADIATOR

a Bunsen burner is placed under the radiator, entirely enclosed in a cast iron combustion box. Directly above the burner is the water chamber (see sectional view). An automatic regulator governs the gas supply, guaranteeing the minimum consumption of gas and the maximum heat.

Operation of "Gasteam" Heating System—When heat is required in any room, a match is all that is necessary. By turning the gas cock and applying the match, as to an ordinary gaslight, the burner is lighted, the steam is formed in the water chamber and inside of 30 minutes there is a 5-lb. pressure and a good warm room.

Advantages of "Gasteam"—(1) It gives steam heat when and where it is wanted.

(2) It eliminates the boiler, the chimney, the coal bin, the piping necessary in a central heating system.

(3) There is no dirt, no ashes, no dust, no smoke, no firing of the furnace, no janitor when "Gasteam" radiators are used.

(4) When heat is required it can be had anywhere in the building by simply lighting a match and turning a gas cock—the "Gasteam" radiator does the rest.

(5) "Gasteam" radiators are furnished in several sizes and heights to meet requirements.

Ultra-Violet Ray Sterilizer

The advantages of sterilization of water by ultra-violet rays, as compared with other methods of water sterilization, are as follows:

(1) Its action is direct and positive, and results in a complete sterilization of the water. It is a system which has an efficiency of 100%, 100% of the time.

(2) The treatment results in absolutely no chemical change in the water treated. It generates no odor, no

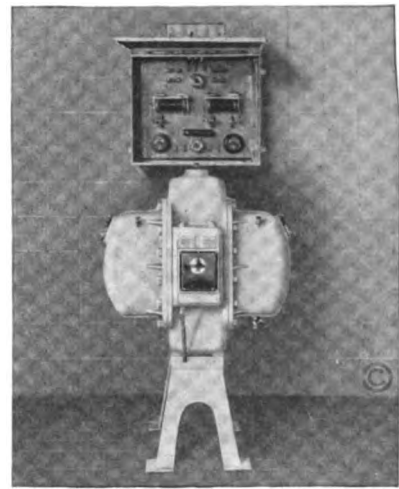
taste, no heat, nor any physical change in the water treated.

(3) It does away to the utmost possible extent, with the human element. No attention or care is required, except that of starting the lamps.

(4) The apparatus is so simple in its construction that there is nothing about it that requires adjustment or repairs. With the exception of the lamps, which of course, eventually will have to be renewed, the depreciation on the apparatus is practically nothing.

(5) Its initial cost and the cost of operation are only a fraction of those involved in any other system of water sterilization.

(6) Its cost of operation, in electrical energy consumed, is nominal.



TYPE H-2 R.U.V. WATER STERILIZER

Industrial Plant Plumbing

Madden's Patent Closets

—The operating valve is strongly built; the operation is absolutely automatic. There are no chains to be lost. The woodwork is especially designed to withstand hard usage; the tank of galvanized iron can not leak or get out of order.

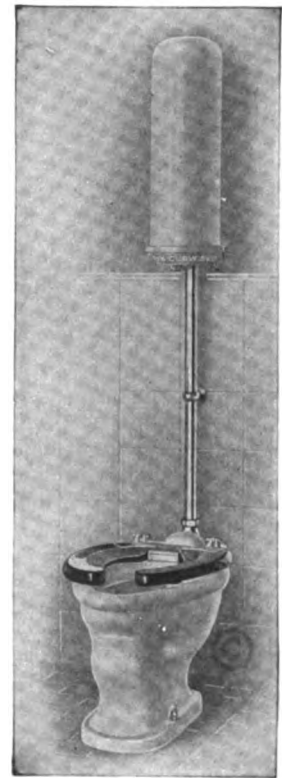
Drinking Fountains—

We have many designs of drinking fountains to answer the many different demands.

Send for circulars illustrating complete line of drinking fountains.

Factory Wash Sinks—

Washing facilities have always been a great question with the employer. Many new features are today considered as essential. A careful study of the subject by our Engineering Department brings forth many improvements for industrial work.

THE "JETRIC" CLOSET,
MADDEN'S PATENT

Catalogues

Complete catalogues gladly sent on request. The following will aid in the selection of the catalogue suited to the requirements:

Plumbing, Catalogue "M."

Drinking Fountains, Fountain Catalogue.

Heating, Special Catalogue.

Cast Iron Pipe, Fittings and Foundry Products—Pipe Economy.

Steam and Water Work Supplies, Catalogue "A."

Water Sterilization, R.U.V. Catalogue.

JOHN SIMMONS CO.

Plumbing Supplies

GENERAL OFFICES
102-110 Centre Street
NEW YORK, N. Y.

PLUMBING WAREHOUSE, Bush Terminal, BROOKLYN, N. Y.

Products

PLUMBING EQUIPMENT for Factory Installation.

Also, Cocks: Brass and Iron, for steam, water, gas, air, ammonia and acid; Ball, Basin and Hydrant.

For Pipe and Fittings, see page 398.

Equipment for Factory Installation

The efficiency of the employee is governed in large measure by his surroundings. Light, cheery quarters, with plenty of fresh air, have produced amazing returns in added output. Plumbing equipment is meeting with the careful consideration of many of the foremost manufacturing concerns. They realize that proper plumbing facilities lead to cleanliness, and cleanliness to better health for their workers.

Closet Combinations

There are many different styles of closet combinations for use in factory installation. For this kind of work a heavy "Giant" bowl with integral seat, and nickelplated flush valve with brass oscillating handle is recommended.

References—This company has completed contracts for this kind of equipment with the following concerns:

De La Vergne Machine Works
Downey Shipbuilding Corp.
E. I. du Pont de Nemours & Co., Inc.
Essex Foundry
Florida East Coast Railway
Ford Instrument Company
General Chemical Company
United Fruit Company
Vulcan Rail & Construction Co.
West Virginia Pulp & Paper Co.

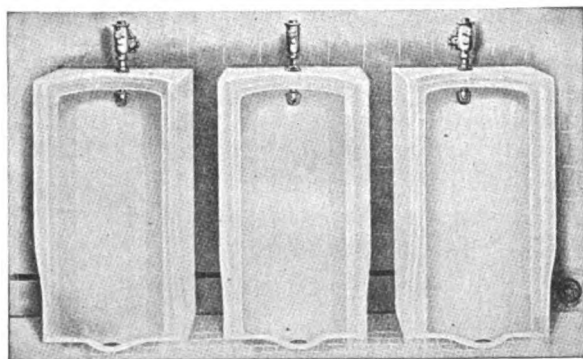


RANGE OF SOLID PORCELAIN "IDEAL" FACTORY LAVATORY BASINS WITH INTEGRAL SOAP HOLDERS

Basins are furnished either back to back or for wall support. Each basin measures 18x21 in. Inside measurement 15x17x6½ in. Range is supported on "Universal" cast iron floor brackets, and equipped with pipe supports, supply pipes for hot and cold water and Fuller or compression bibbs

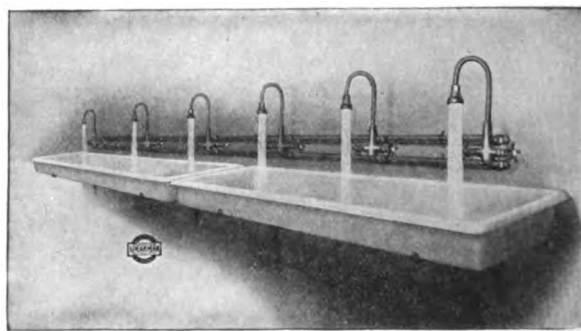
Inquiries

JOHN SIMMONS Co. has specialized in installations of this kind, and invites inquiries.



RANGE OF SOLID PORCELAIN URINALS

Urinal is glazed all over, and fitted with nickelplated strainer for lead or iron pipe connection, nickelplated spreader, and nickelplated flush valve, the combination making the most sanitary outfit procurable. 18, 24 or 28 in. wide



FACTORY LAVATORY OUTFIT WITH SPECIAL DOUBLE COMPRESSION FAUCETS WITH GOOSENECK AND SPRAY

BRADLEY WASHFOUNTAIN CO.

Manufacturers of Lavatory Fixtures

MILWAUKEE, WIS.

SALES OFFICES

MILWAUKEE, WIS., 373 Broadway

CHICAGO, ILL., 1175 Old Colony Building

Products

WASHFOUNTAINS.

Also manufacturers of Ornamental Fountains.

Uses

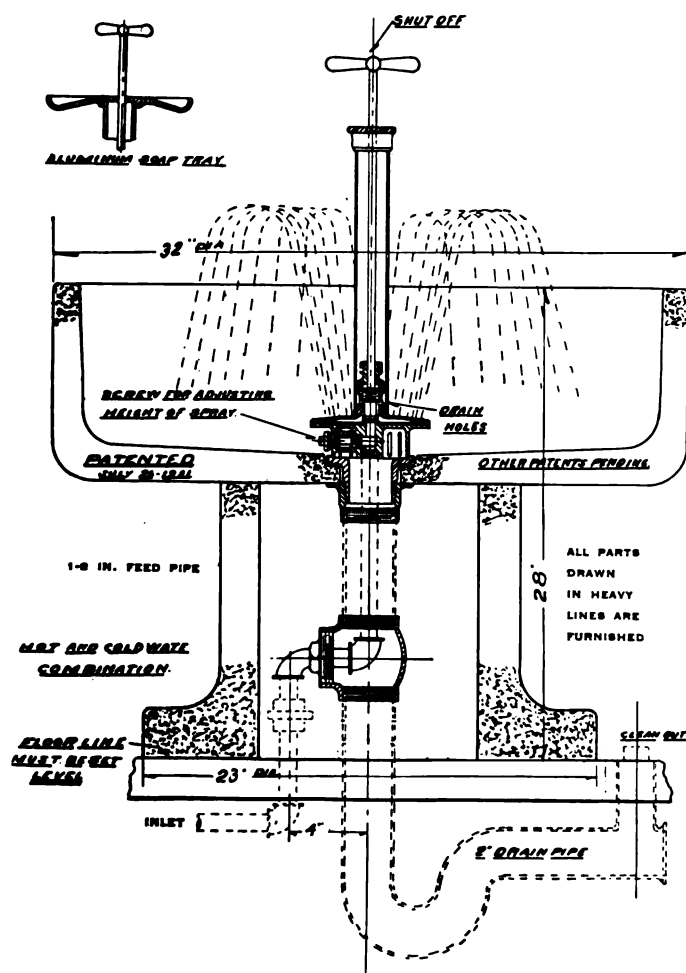
Bradley Washfountains are well adapted for installation in factories, public buildings, schools, hotels, railroad stations and public lavatories.

Advantages

These Washfountains operate successfully because they effect certain needful economies and sanitary improvements: Save floor space; save installation expense; save water; save time in washing; easy to keep clean; prevent infection; please the user.



TYPICAL FACTORY INSTALLATION OF A 54-IN. WASHFOUNTAIN OF MARMORITE—12 CAPACITY



SHOWING CONSTRUCTION OF BRADLEY WASHFOUNTAIN

Description

Construction—The Bradley Washfountain is made of marmorite, a composition of crushed marble and concrete—waterproof, lustrous and very durable. It may also be had in granito, a special composition, chiefly concrete, not as lustrous but equally smooth and durable, and used in some industrial installations.

Sizes—There are two sizes: 54 in. across, to accommodate 12 persons; or 32 in. for 6 users. The hand or foot control may be specified in either size, also the cake soaptray or special Bradley liquid soap container as desired.

Floor Space—The height of the spray is adjusted by the fountain-head screw. By simplifying connecting parts, installation costs are reduced. This fountain saves one-third to one-half of the floor space, as follows:

- 1 Washfountain, $5\frac{1}{2}$ sq. ft. for 6 people.
- 6 individual bowls, 15 sq. ft. for 6 people.

and, what is most important to the user, it is a sanitary, pleasing way to wash.

Catalogue

A catalogue will be gladly sent on request. Simply use your business letterhead.

THE ALLEN FILTER COMPANY

TOLEDO, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES

Products

100% WATER PURIFIERS.
INSTANTANEOUS COIL WATER COOLERS.
SANITARY DRINKING FOUNTAINS.
CAFETERIA COIL WATER COOLERS.
AUTOMATIC GLASS FILLERS.

Also manufacturers of Beverage Dispensers and Drinking Water Systems.

Allen 100% Water Purifiers

These are not water filters, but *water purifiers*.

The health of employees is a most valuable asset which should be preserved by sanitary conditions and properly purified drinking water.

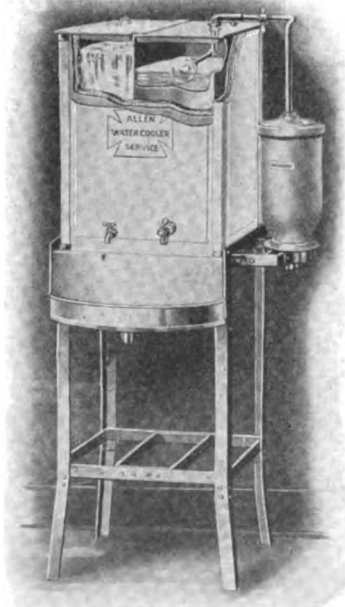
Allen 100% water purifiers operate on city pressure and are made in 10 types suitable for any service.

The peculiar texture of the purifying mass (un-glazed porcelain) removes all matter in suspension, such as lime, iron, alkali, sulphur, disease germs, etc. It will continue to do this indefinitely, producing a safe and palatable drinking water and supplementing the work of municipal plants.

Record and Efficiency—Allen 100% water purifiers have a record of 20 years' satisfactory operation, having the approval of state and city boards of health for use under all conditions.

Scientific research work by eminent bacteriologists in water purification with particular reference to un-glazed porcelain as used in the Allen water purifier fully justifies our guarantee to remove disease germs.

Square Type No. 740—For large offices, factories, stores or public institutions, combining our No. 7 purifier with No. 40 cooler. Supplies from 40 to 50 people. Filled by automatic shut-off valve with glass float. Purified water protected by tight cover.



ALLEN 100% WATER PURIFIER
Square type No. 740

Capacity of reservoir, 5 gals. Daily purifying capacity, 50 to 75 gals. Ice capacity, about 40 lbs. in one piece—no contact with purified water. No chemicals necessary to kill germs or coagulate water before purifying.

Dimensions: height with 40-in. legs, 50 in.; with 30-in. legs, 40 in. Size, packed for shipment, 18x20x30 in. Shipping weight, 150 lbs.

ALLEN
TRADE MARK

Allen Instantaneous Coil Water Coolers

Drinking water properly chilled and served adds to the efficiency of employees. Proper apparatus for such purpose will

reduce overhead.

THE ALLEN FILTER COMPANY guarantees the nationally approved Allen instantaneous coil water cooler for 5 years.

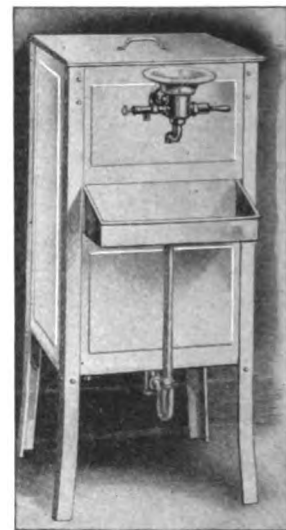
Unless otherwise specified, all coolers are fitted with 20 ft. of brass coil, tinned inside and outside. Will cool 3 glasses of water per minute. Where demand is greater, use a 40-ft. coil. For supplying a number of drinking fountains or circulating systems, a 60-ft. coil is recommended with larger cooler box.

Advantages—Square cooler box admits ice in one piece, insuring a saving because it lasts longer. Easily cleaned at any time without removing coil.

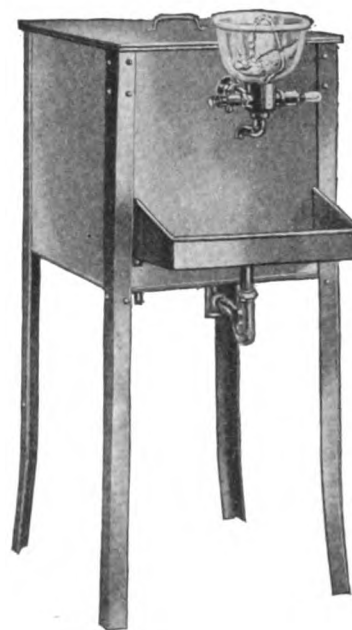
Cork insulation between two walls of heavy galvanized iron. Tight cover keeps out air.

The Allen coil is *all in the bottom* of cooler box. Ice rests directly upon coil without crushing it. When ice has melted, cold water covers entire coil.

All types furnished in battleship gray or white. Water inlet threaded for 3/8-in. iron pipe; waste outlet for 1/2-in. iron pipe.



No. 100 BDF WITH
UPRIGHT BUBBLER



No. 50 BDF WITH ANGLE FLOW
BUBBLER

ALLEN INSTANTANEOUS COIL WATER COOLERS

No.	Ice capacity, lbs.	Approx. number persons served	Average shipping weight, lbs.
35	35	35	75
50	50	50	90
100	100	100	110
200	200	200	150

Extra coil may be used in larger sizes to care for more people than above.

New Cafeteria Specials

No. 200—Holds 200 lbs. ice, cares for any reasonable demand. Construction same as No. 100 on opposite page except it measures 36 in. front, has six shelves, full width drip pan and 60 ft. of coil; also two glass fillers.

No. 100 Duplex—Same as No. 100 on opposite page except it has six shelves and glass filler front and back.

Allen Sanitary Drinking Fountains

To meet the requirements of a sanitary drinking fountain, we employ a regulator so that height of bubble can be maintained at 2 in. above integral head, as required by some boards of health. We also employ an integral fountain head made so that lips can not touch it when water is flowing. Sufficient openings for quick drainage of waste water.

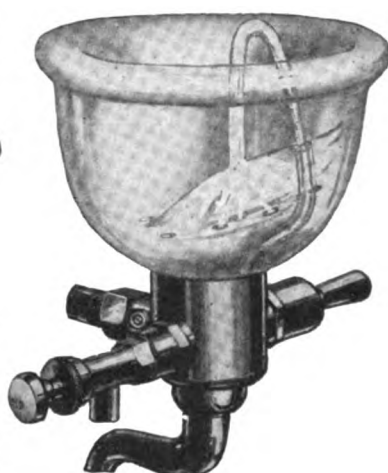


No. 1F TYPE UPRIGHT FLOW ALLEN
SANITARY DRINKING FOUNTAIN

6-in. vitreous china bowl with integral head. Pressure regulator and self-closing push button valve for filling glasses. China index handle and oscillating handle valve for bubbler. Inlet for $\frac{3}{8}$ -in. iron pipe; waste for $\frac{1}{2}$ -in. pipe.

No. 1 Type—Same as above except no side glass filler. Also made with 4-in. brass bowl.

No. 5 Type Wall Bubbler—Same as No. 1 except has 9-in. bowl and brackets. Waste for $1\frac{1}{4}$ -in. trap.



No. 1AF TYPE ANGLE FLOW ALLEN
SANITARY DRINKING FOUNTAIN

6-in. extra heavy vitreous china bowl. Ample provision for waste water to drain immediately. At apex of flow, water falls with unusual volume and rapidity, which, in connection with our regulator, prevents water from squirting over edge of bowl. In falling, stream is broken up and scattered by round raised bottom into many waste holes. Inlet for $\frac{3}{8}$ -in. iron pipe; waste for $\frac{1}{2}$ -in. pipe.

No. 1A Type—Same as above, except no side glass filler.

No. 5A Type Wall Bubbler—Same as No. 1A, except with 9-in. bowl and brackets. Waste for $1\frac{1}{4}$ -in. trap.

Allen Gravity Bubblers—Used on Allen combined purifiers and coolers, also on portable coolers in place of ordinary faucets.

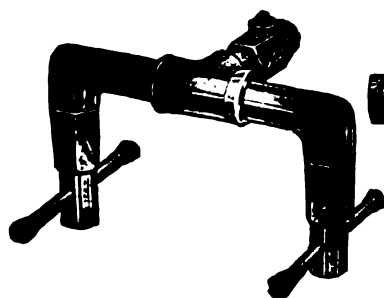
No. 9M Type: Nickel-plated 4-in. or china 6-in. bowl, china bubbling head, self-cleaning drain, self-closing faucet. Special flow regulating device. Supplied with shank and lock nut connection for $\frac{3}{8}$ -in. iron pipe or $\frac{1}{2}$ -in. hole.

No. 9MF Type: Same as No. 9M, except has side valve for filling glasses.

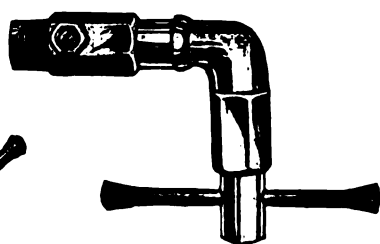
Allen Pedestal Fountains—Furnished with Nos. 5 and 5A bubblers listed above. Height, 40 in. Finished in rustproof, air drying, battleship gray enamel. Waste outlet for $1\frac{1}{2}$ -in. pipe.

Allen Automatic Push-up Glass Fillers

Designed for gravity or city pressure. While self-cleaning, can be easily taken apart. Water releases through inside of cross arm body. Made in single and double types.

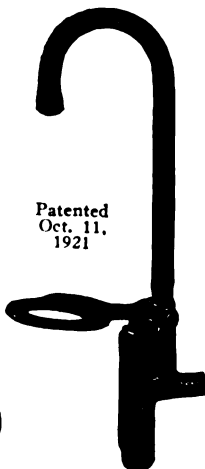


No. 3-P Double Push-up Type



No. 2-P Single Push-up Type
ALLEN AUTOMATIC GLASS FILLERS

Inlets threaded for $\frac{3}{8}$ -in. iron pipe. Made entirely of nickelplated brass.

Allen Automatic Push-down Glass Fillers

Patented
Oct. 11,
1921

No. 1 Single Push-down Type

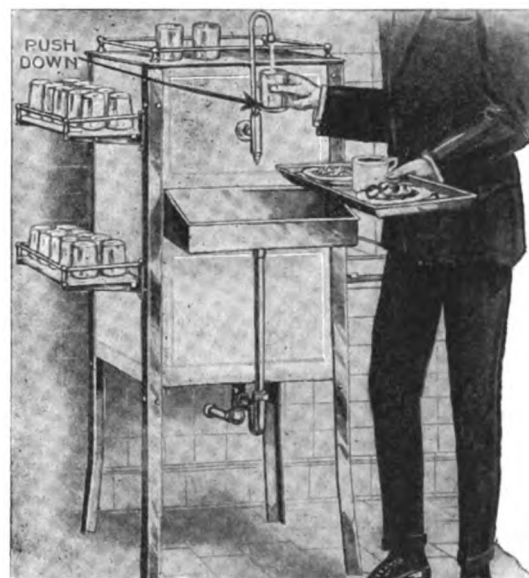
Allen Cafeteria Coolers

Coil of special brass tubing, tinned inside and outside, and fitted in bottom. Need not be removed to clean box; simply pull out waste water outlet and flush with hot water.

Cooler box made with 2 walls of heavily galvanized iron packed with cork. Legs are heavy brass angle, nickelplated and attached to body entire length, making it rigid. White porcelain enamel plates attached to sides of box.

Drip tray is nickel silver with screen. Brass nickelplated waste pipe from drip pan is $\frac{1}{2}$ in. and connected to waste water outlet under bottom from ice compartment. Supply inlet for $\frac{3}{8}$ -in. pipe. Nickel silver cover with nickelplated brass railing and posts.

Railing firm enough to lift cover by grasping near posts. White enamel shelves, 6x16 in. and hold 10 glasses each. Shelf railing and brackets are nickelplated brass.



No. 100 ALLEN CAFETERIA COIL COOLER WITH SINGLE
PUSH-DOWN GLASS FILLER

Holds 100 lbs. of ice in one piece. When ice is melted, coil is submerged in remaining ice water. Coil, 40 ft. Size, 16x16x26 in. with 14-in. legs. Height over all, 42 in. Floor space, 18x18 in.

Nos. 50 and 200 hold 50 and 200 lbs. of ice, respectively; coil, 20 and 60 ft., respectively.

Rapid filler. Clean shut-off; no leaky outlet. Sanitation 100%. Breaking of glass eliminated. Easily attached.

Fills the requirements of health boards.

For city pressure only. Easily regulated. Can not get out of order with ordinary use. Releases water with slight hand pressure. Glass does not touch any part of outlet. Fills rapidly and water is shut off immediately when pressure is released. Gooseneck attached so that it can be easily turned to one side to fill bottles or pitchers. Distance between outlet and bottom of glass holder, 5 in. Can be used for dispensing water from any fountain. Made in single and double types.

HALSEY W. TAYLOR CO.

Sanitary Drinking Fountains
WARREN, OHIO

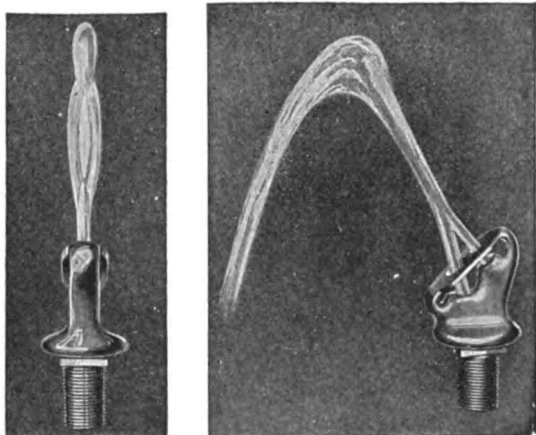
Products

PURITAN SANITARY DRINKING FOUNTAINS (Patented).

Puritan Sanitary Drinking Fountains

Puritan cantonment drinking fountains were designed to meet the demand of the government for better drinking equipment for use in cantonments, naval training stations, etc. They have been approved and adopted by all departments of the army and navy.

The Puritan stream projectors are recognized as superior to all others. Both sanitary and practical.



PURITAN 2-STREAM CONVERGING MOUND BUILDING STREAM PROJECTOR

Used on fountains 562 to 579 inclusive

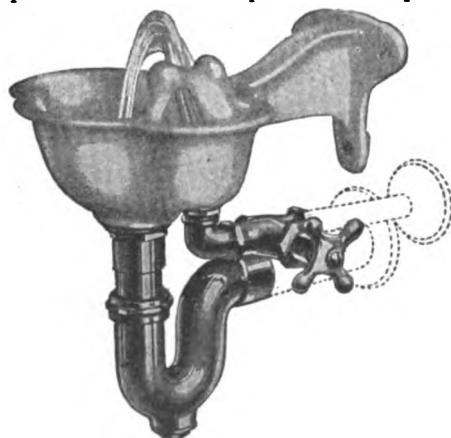
Puritan 566 "Cantonment" Wall Type Drinking Fountains

Drinking fountain and glass filler combined. Bracket and receptor, cast iron vitreous enameled all over; 2-stream converging mound builder side stream projector. Nickelplated self-closing valve with volume regulator in valve; nickelplated brass strainer.

Projection from wall, 11½ in.; to center of drinking mound, 8 in.; receptor, 9½ in. over all; supply, ¾ in.; outlet, 1 in.

Price, complete\$20.00

Price, complete with 1¼-in. nickelplated brass trap..... 23.00



PURITAN 566 "CANTONMENT" WALL TYPE DRINKING FOUNTAIN, SHOWING CONCEALED SUPPORTING ATTACHMENTS

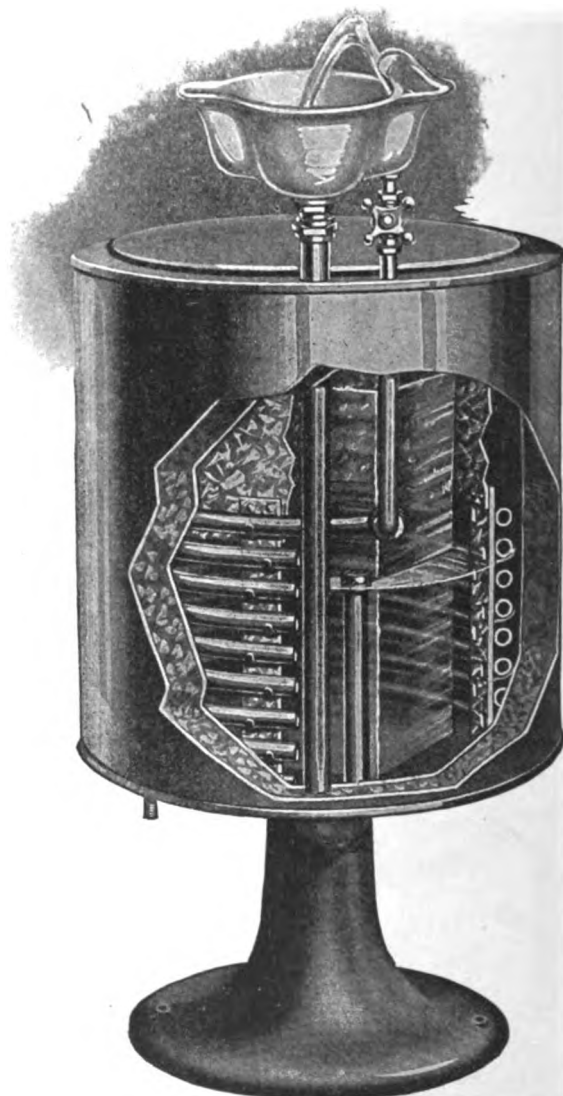
Puritan 570 "Cantonment" Cooler Fountains

Cover, top and base made of cast iron. Body, tank and coil guard, galvanized sheet iron. Re-granulated cork insulation in side walls and pressed corkboard in bottom and cover. Cooling coil, ½ in. outside diameter. No. 20 gage seamless brass tubing, tinned both inside and outside. 2-stream converging mound builder projector. Self-closing valve and regulator.

Ice capacity, 100 lbs. cracked or 80 lbs. lump. Ice consumption, approximately 1 lb. per capita per day.

Ice chamber, 19 in. outside diameter by 19 in. high; height from floor to top of ice chamber, 32 in.; height from floor to top of bowl, 39 in.; diameter base, 14 in.; fountain receptor, 9½ in. over all; supply, ¾-in. iron pipe; waste, 1-in. iron pipe.

Price, complete as shown.....\$30.00



PURITAN 570 "CANTONMENT" COOLER FOUNTAIN INTERIOR

Puritan 562 Fountain Head

Made from vitreous china with nickelplated brass base and projector. The projector used is the famous "2-stream converging mound building side stream projector" which produces a practical drinking mound at the highest point of projection.

This fixture is designed to replace present unsanitary bubblers on drinking fountains already installed. Price, as shown and described.....\$6.00
Price, with lever handle self-closing valve12.00



PURITAN 562
FOUNTAIN HEAD

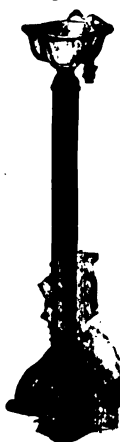


PURITAN 575
FOUNTAIN HEAD

Puritan 575 Fountain Head

Same as 570 fountain bowl; furnished with self-closing valve and regulator. Used to replace present unsanitary heads on coolers and pedestal fountains.

Price, complete as shown\$17.00
Price, less self-closing valve with regulator 12.00



568



520-68

PURITAN PEDESTAL
FOUNTAINS

Puritan 568 Pedestal Fountain

Cast iron open base; 21½-in. outside diameter tubing; 2-stream projector and self-closing valve with volume regulator; supply, ¾ in.; waste, 1 in.

Price, 36-in. height, complete\$25.00
Price, 39-in. height, complete 26.00

Puritan 520-68 Pedestal Fountain

Combines the sturdy construction of 520 pedestal with sanitary features of 568 "Cantonment" fountain head.

Fountain receptor made from cast iron, vitreous enameled; equipped with "2-stream converging side jet projector," and furnished with cross handle self-closing valve and loose key regulator, which is concealed by slip base. Supply, ¾ in.; waste, 1 in.

For dimensions and other details of construction see 520.

Price, 39-in. height, complete.....\$40.00
Price, 42-in. height, complete..... 41.00

Puritan 571 Plain Cooler

This plain cooler tank can be used in connection with fountains already installed or where it is desired to conceal cooler.

Price, complete as shown.....\$70.00



PURITAN 571
PLAIN COOLER



PURITAN 573
COOLER
FOUNTAIN

Puritan 573 Cooler Fountain

Constructed same as 570 cooler but is furnished with 9½-in. vitreous china bowl and "4-stream angle jet projector."

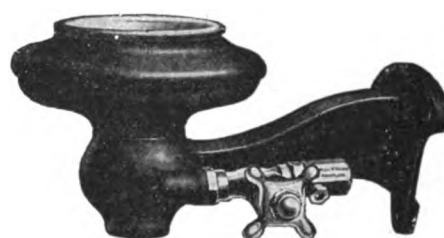
Price, complete as shown.....\$80.00

Puritan 540 Wall Type Drinking Fountain

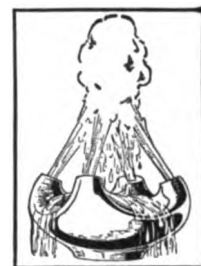
For mills, factories, schools, railroad depots, etc. Heavy 6-in. vitreous china bowl, mounted in cast iron bracket and bowl support; "4-stream angle jet projector"; self-closing valve with volume regulator in valve. Finished in battleship gray.

Length over all, 12 in.; diameter of bowl support, 7 in.; height, 6 in.; inlet tapped, ¾ in.; waste, 1 in.; iron pipe thread.

Price, complete\$16.50



PURITAN 540 WALL TYPE
DRINKING FOUNTAIN



PURITAN "4-STREAM
ANGLE JET
PROJECTOR"
(Patented)

Used on fountains 501
to 549 inclusive

Puritan 520 Mill Type Pedestal Fountain

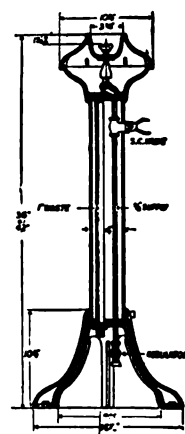
With heavy vitreous china bowl and "4-stream converging projector." A sturdy and durable fountain for use in steel mills, foundries, etc. Sanitary, convenient, foolproof. Has all the advantages of an open base pedestal, with the sanitary features of a closed base; no catch place for sweepings and other floor litter.

Made with heavy cast iron top and base with 4-in. outside diameter steel tubing standard; enclosed galvanized supply and waste pipes. Self-closing valve. Loose key regulator concealed in base.

By raising bell-shaped base (see illustration) connections can be made without disturbing floor or concrete. After connections are made, pedestal is bolted to foundation, stream adjusted, and base lowered to proper position concealing regulator.

Made in two heights, 39 and 42 in. Diameter, receptor 6 in. Diameter, adjustable base, 16½ in. Height, base, 10½ in.; supply, ¾ in.; waste, 1 in.

Price, 39-in. height, complete.....\$35.00
Price, 42-in. height, complete..... 36.00



Cross Section
Showing Construction
and Dimensions



Based Raised for
Installing and
Regulating
Height of
Stream

Base Lowered to
Proper Position
After Connections
Have Been Made

PURITAN 520 MILL TYPE PEDESTAL FOUNTAIN

THE MURDOCK MFG. & SUPPLY CO.

Drinking Fountains and Hydrants

426-430 Plum Street
CINCINNATI, OHIO

Products

ANTIFREEZING HYDRANTS, HOSE BOXES and DRINKING FOUNTAINS.

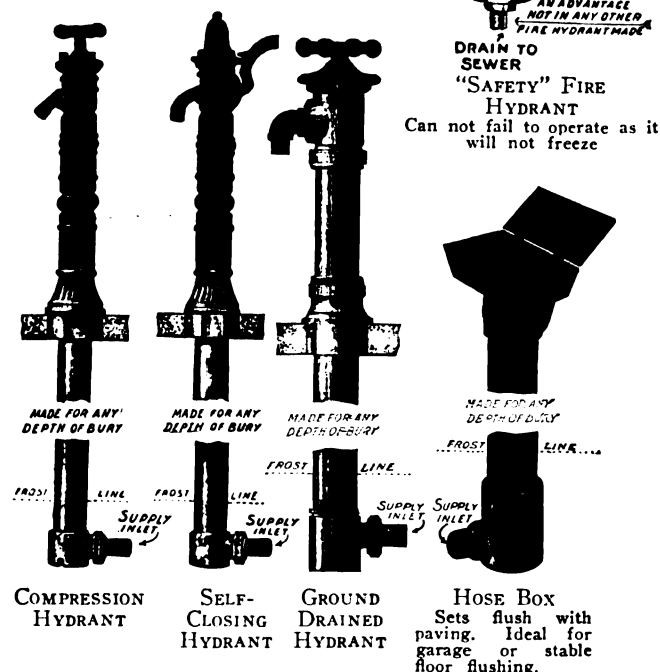
Also manufacturers of Railway Water Service Devices.

Murdock "Safety" Antifreezing Fire Hydrants

Murdock "Safety" fire hydrants are not to be confused with ordinary fire hydrants and plugs that are designed to drain through the ground and which are liable to freeze, due to the water in the shank failing to drain off completely. The Murdock "Safety" fire hydrant has a full 2-in. waterway and a large connection to the sewer, so that *the drain is positive, freezing is impossible and operation is certain.* The Murdock antifreezing feature is not to be found in any other fire hydrant (see illustration).

Genuine Murdock Yard Hydrants and Hose Boxes

This company makes a line of antifreezing yard hydrants and hose boxes for homes, factories, mills, railroads, mines, stockyards, tanneries, etc. (see illustrations).



Made for 1½-, 1¾- or 2-in. iron pipe and hose connections. Hose boxes for ¾- and 1-in. also. Opening through hydrants and hose boxes 1½ in. In ordering be careful to give length (or depth of bury) and whether wanted for lead or iron pipe connections

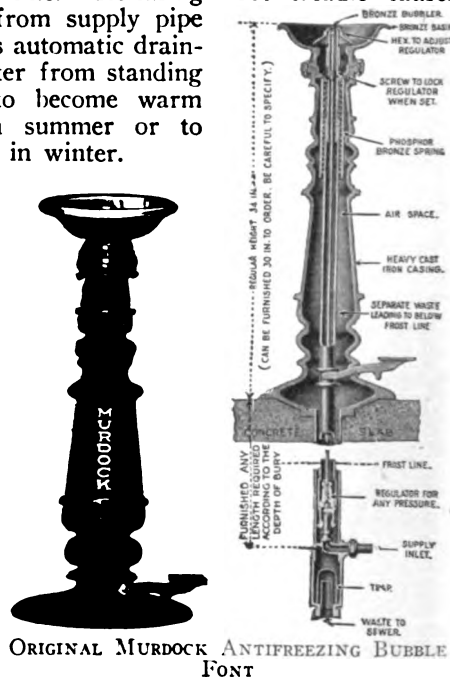
Original Murdock Antifreezing Drinking Fountains

Scientifically designed pedestal type drinking fountains, ideal for outdoor and indoor use.

Outer shell is of heavy cast iron, simply ornamented and painted green. Other colors to order.

Distinctive Features—The solid working valve and the supply regulator are located in the ground *below the frost line.* A foot treadle opens the valve and permits the water to rise to the bubbler. A separate waste pipe conducts overflow from the basin to a point back below the frost line. Releasing foot treadle causes water to drain from supply pipe into sewer. This automatic drainage prevents water from standing in the fixture to become warm and stagnant in summer or to freeze and burst in winter.

All parts are substantially heavy and all inner parts are brass. No flimsy self-closing cock to get out of order. The integral trap prevents the sewer gases from rising to the bubbler. Valve can be repacked or any part replaced *without digging up the fixture.*



Lily White Bubble Font

A heavy, cast iron pedestal fountain in graceful lines, finished in pure white vitrolite, free of all ornamentation. Adapted for outdoor or indoor use and has the same interior mechanism as the original Murdock fountain. Bubbler and basin are made of solid bronze, nickelplated.

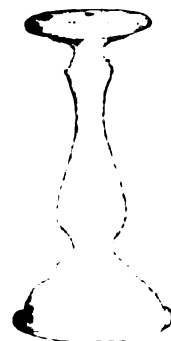
Also furnished with Murdock patent and antifreezing parts to any depth desired.

Regular height 36 in. above floor; diameter of basin 12 in.; diameter of base 16 in.; four ½-in. bolt holes on 14½-in. diameter of circle; treadle protrudes 1 in. beyond base.

Information Required When Ordering Fountains

Outdoor Fountains—Specify depth of bury (length required below surface of the ground) sufficient to have valve and all working parts below a possible freezing point.

Indoor Fountains—Specify kind and thickness of flooring and whether supply and drain are to be concealed or exposed.



LILY WHITE BUBBLE FONT

THE E. F. HAUSERMAN COMPANY

Unitbilt Steel Toilet Partitions

1729 East 22nd Street
CLEVELAND, OHIO
BRANCH OFFICES

NEW YORK, N. Y., 41 East 42nd Street

PITTSBURGH, PA., Oliver Building

DETROIT, MICH., Penobscot Building

Products

HAUSERMAN-SYSTEM TOILET and SHOWER PARTITIONS (Unitbilt Steel Construction).

For Hauserman-System Skylights, see pages 216-217; for Hauserman System Industrial Partitions, see pages 908-911; for Hauserman-System Shelving, see pages 916-917.

Service

Hauserman-System toilet partitions are *designed, built and installed* with a view to economy, interchangeability and utmost sanitary utility. The Hauserman-System, "Organized for Service," extends from a thorough study of requirements to the final installation of the job.

Hauserman-System Toilet Partitions

Hauserman-System toilet partitions are *designed* built on the same basic idea as Hauserman-System office and industrial partitions—standardization, interchangeability, flexibility, economy and continuous utility. Finished in baked-on olive green enamel they are neat

and attractive in appearance. They are easy to install, with sufficient flexibility to permit adaptation to any type of wall connection. The floor connections are most substantial, without appearance of bulk.

The Hauserman-System toilet partitions are made in two types:

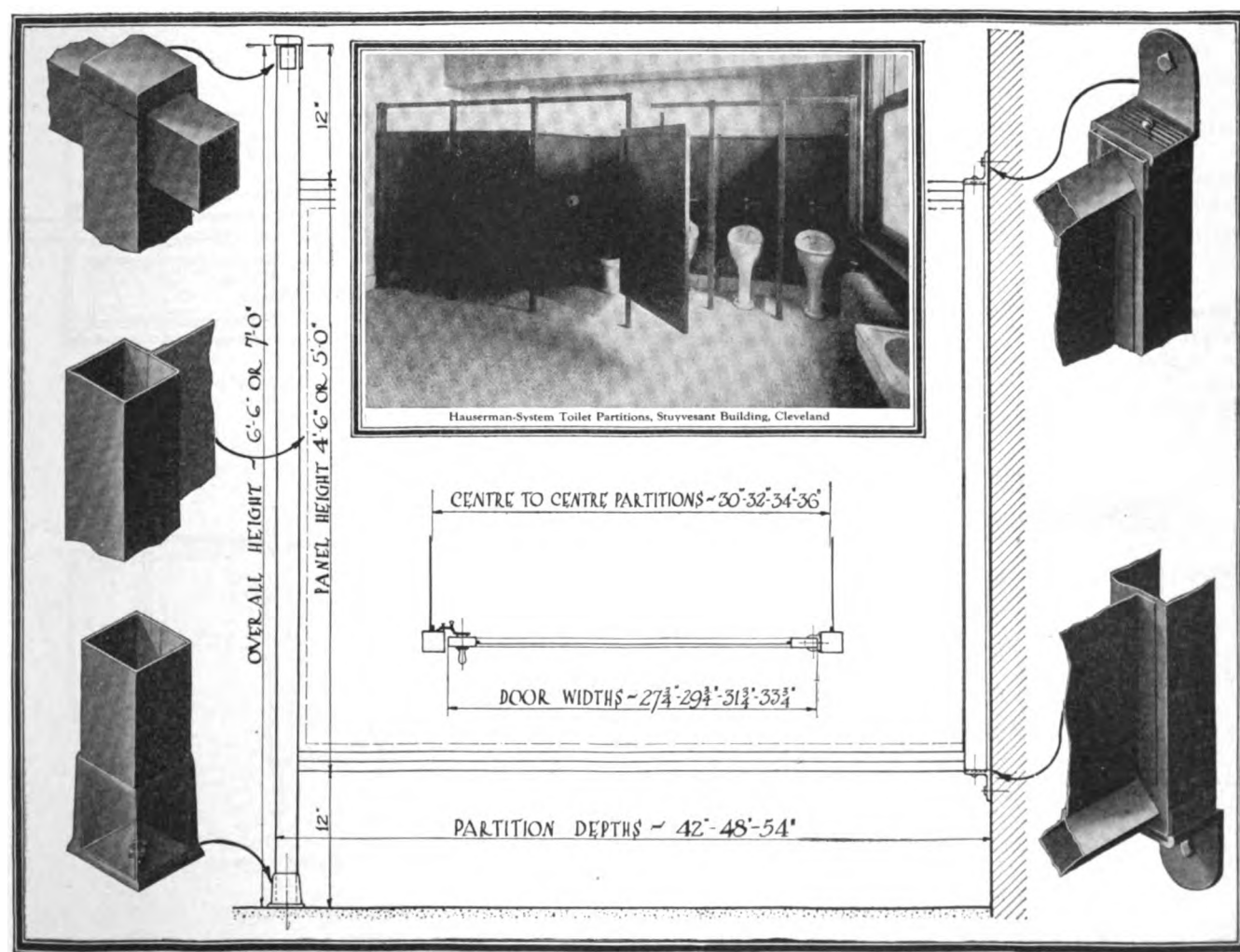
Type A, when no doors are required or a full width door is used between compartments. Standard sizes on sheet No. 6.

Type B, when door-swing space is limited or an architectural type is desired, a standard 26-in. door is used with a variable panel from 4 to 10 in. wide.

Hauserman-System toilet partitions are 100% usable, 100% salvageable, 100% complete.

Installation

Hauserman-System toilet partitions are sold preferably on the basis of a complete installation by us. Our workmen, employed continuously in erecting our products, acquire experience and speed which enable them to erect a job more satisfactorily and at less cost than by inexperienced men.



DETAILS OF TOILET PARTITIONS

HASKELITE MANUFACTURING CORPORATION

Plymetl "Wide Stiles" Toilet Partitions

TELEPHONE
MAIN 3675

Chamber of Commerce Building
CHICAGO, ILL.

FACTORIES: GRAND RAPIDS and LUDINGTON, MICH.

Products

PLYMETL "WIDE STILES" TOILET PARTITION for toilet rooms and urinals, furnished with or without doors.

Also manufacturers of Plymetl, the Steel Faced Plywood, in Panels for general engineering uses; Plymetl Wainscoting for halls and corridors; Plymetl Fire Resisting Units for walls between suites in office buildings, hotels, etc., and Plymetl Fire Resisting Doors for offices and hospitals.

Toilet Partitions

Characteristics — This type of toilet partition combines the good features of the expensive marble partition and the inexpensive metal partition. It is massive in appearance, non-resonant, light in weight, yet strong and stiff,

PLYMETL
TRADE-MARK

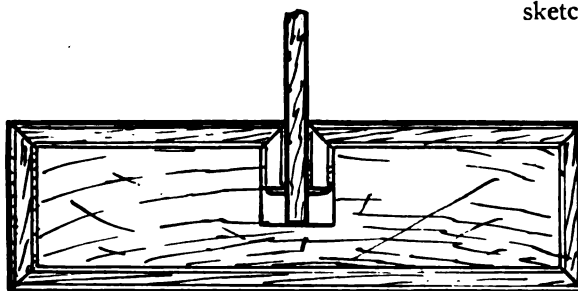
sanitary, durable and rapid in erection.

The Plymetl panels that form the partitions themselves have a core that consists of 3-ply plywood to which are firmly cemented sheet steel faces galvanized on the hidden side.

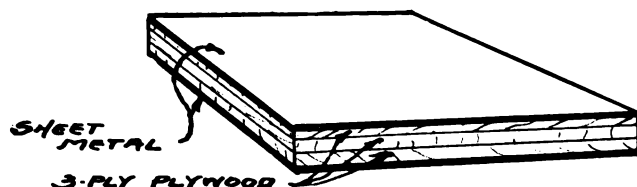
To form the "Wide Stiles" for the part of an enclosure, Plymetl having a single steel face is folded about and glued (waterproof) to a wood core in such a way as to leave a T-slot in which one edge of the partition panels is secured as indicated in the sketch.



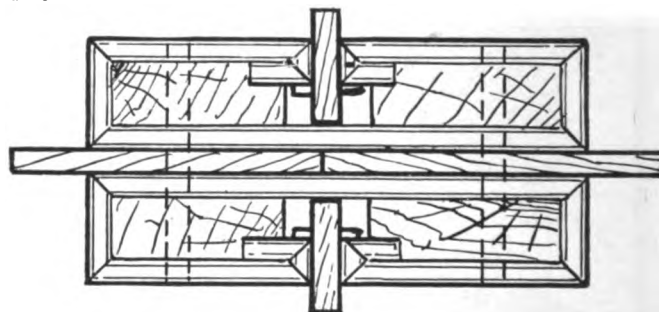
Head Rail



Front Stile

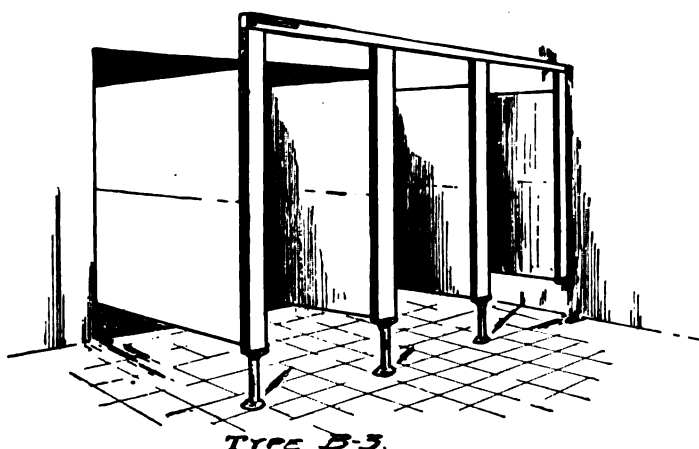


Partition

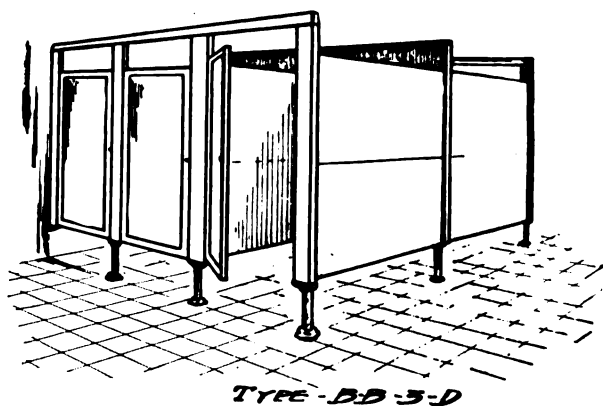


Interior 4-way Stile for Back to Back Installation

DETAILS OF PLYMETL "WIDE STILES" TOILET PARTITION



TYPE B-3

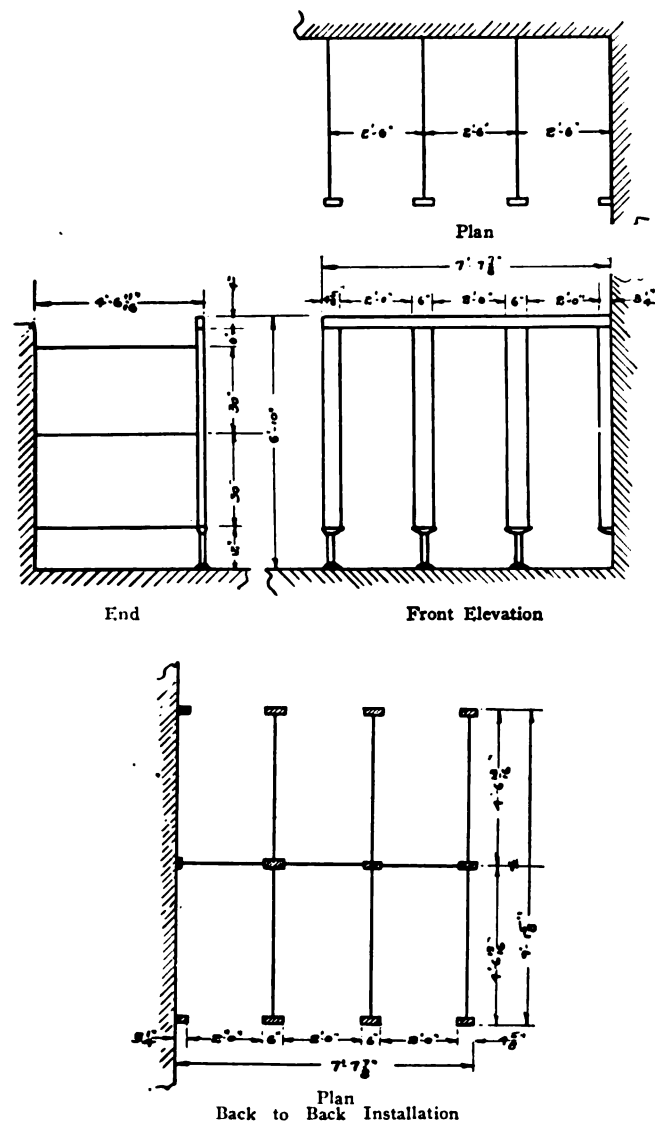


TYPE BB-3-D

SAMPLE INSTALLATIONS OF PLYMETL "WIDE STILES" TOILET PARTITIONS
Occupant's clothes need not brush against wet plumbing fixtures

The head rails and the interior stiles used for free standing rear walls are constructed in a similar manner, as shown by illustrations below.

Panels are attached to walls or to furring strips by a method that closely follows the erection of marble or by means of metal coves, either method being rapid in execution and neat and strong in its result.



DETAILS OF PLYMETL TOILET PARTITION INSTALLATION

Standard Sizes

The sizes already in use are shown in the drawing; they are furnished in any multiple. Other sizes will be furnished to meet requirements.

Finish

Plymetl toilet partitions may be painted or enameled as desired.

Specifications

All toilet partitions, including backs for the same where needed, shall be of Plymetl "Wide Stiles" construction, to be supplied and erected in accordance with drawings to be submitted by the contractor for this work, and subject to the approval of the architect.

Each center stile is to be 6 in. wide and $1\frac{3}{4}$ in. thick, constructed of Plymetl and provided with a T-slot for the insertion of the partition panels. This stile is to be rigidly mounted on a base 12 in. high, adjustable in height to accommodate minor variations in floor level; the base is to consist of $1\frac{1}{4}$ -in. galvanized pipe, provided with suitable galvanized head and foot castings.

Each end stile is to be $4\frac{5}{8}$ in. wide, but otherwise similar to center stile.

Each wall stile is to be $3\frac{1}{4}$ in. wide, $1\frac{3}{4}$ in. thick, similarly constructed but provided with an offset for the wall panel and mounted on an appropriate galvanized base casting to be attached to the wall.

Each head rail is to be 4 in. high and $1\frac{3}{4}$ in. thick, constructed of Plymetl and securely attached to the top of each stile by means of hidden screws. Its face is to be flush with the face of each stile.

Each partition is to consist of two Plymetl panels, each having a 3-ply plywood core and two steel faces, galvanized on the hidden side; at the horizontal joint between the panels their edges are to be set in an "H" metal moulding that closely fits the panel thickness.

All Plymetl parts, castings and mouldings are to be furnished with one shop coat of metal primer applied before shipment from the factory, making the surface suitable for the application of an enamel or painted finish after erection.

The erection is to be carried out in a workmanlike manner and the completed construction is to be strong and rigid both in fact and in appearance.

Erection

Installation is commonly done by one of our numerous agents. The address of the agent most conveniently employed for any contemplated job will be furnished on request. To contractors, who prefer to do their own erection, detailed instructions will be furnished.

Service to Engineers and Architects

Blue prints of typical details will be furnished on request. Our engineering staff will be pleased to make detailed suggestions to engineers or architects regarding the proper solution of pertinent problems.

THE SANYMETAL PRODUCTS COMPANY

Metal Partitions and Doors

980 East Sixty-fourth Street
CLEVELAND, OHIO

NEW YORK OFFICE, 1328 Broadway

BOSTON OFFICE, 44 Bromfield Street

AGENTS IN PRINCIPAL CITIES

Products

SANYMETAL PARTITIONS, DOORS and SCREENS for toilet rooms, dressing rooms, shower baths and urinals.

SANYMETAL GRAVITY ROLLER HINGES for all toilet and part-length swinging doors.

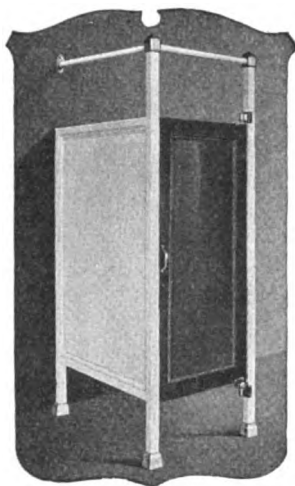
SANYMETAL PARTITIONS for offices, factories, plant hospitals, etc.

Also manufacturers of SANYMETAL Toilet Room Hardware.

Toilet Partitions

SANYMETAL toilet partitions are made of heavy gauge Armco ingot iron, stretcher leveled, electrically welded to an integral hollow metal vertical post, and fitted top, bottom and rear with rigid metal mouldings, all electrically welded into one complete whole.

The door, of similar construction, is fitted with our gravity roller bearing hinge, rubber bumper, and pull. These two units, with the specially designed, sanitary base casting for securing post of partition to floor, caps and pipe rail bracing, constitute SANYMETAL toilet sections.



WHITE SANYMETAL WITH
MAHOGANY DOOR

government tests against rust.

Finish—Partitions and doors are finished with one priming coat of mineral oxide and two coats of olive green or gray enamel, each coat baked on at a high temperature. Base castings, all hinge parts and other door hardware, and all bolts, screws and nuts are electro zinc-plated, which plating process stands

Sanymetal
TOILET PARTITIONS

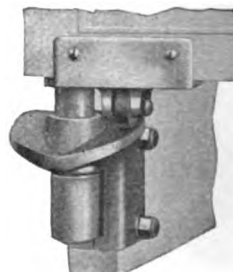
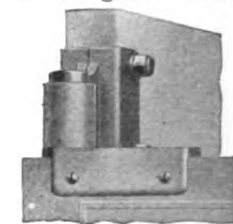
Erection—The erection of SANYMETAL toilet partitions is a simple matter. After base casting is fastened to floor by a concealed screw in the casting, a U-channel

(adjustable to any unevenness) is fastened to the walls. Partitions are then securely fastened to the U-channel; caps are inserted in tops of posts; and the head rail brace is installed and fastened to walls. Doors are then hung on partition posts.

Quotations will be given on SANYMETAL erected or f.o.b. the factory.

Gravity Roller Hinges

For double or single acting doors of wood or steel, made to fit SANYMETAL, slate, marble or wood partitions. Hinge has five parts only. Upper hinge is a heavy stamping with pivot carried in socket; lower hinge is similar, the weight of the door being carried by a wheel roller in a double inclined track. Hinge can be used for either right- or left-hand door and for both in-swinging and out-swinging doors. It is made for any thickness of material, in steel, zinc- or nickel-plated, or in brass nickel-plated.



SANYMETAL GRAVITY
ROLLER HINGE

Shower and Urinal Partitions

For shower and urinal partitions Armco iron alloy (lead coated) is used, finished like the toilet partitions with baked enamel. Construction is the same as in toilet partitions. Wherever showers are desired with a special container or with cement curb, partitions are made to meet these conditions.

Special Combinations

For any layout, height, or floor space, any combination desired may be obtained with standard stock SANYMETAL units.



SANYMETAL IN THE FACTORY OF THE NATIONAL
CARBON CO., CLEVELAND, OHIO



SANYMETAL DOORS, ETC.,
RUSS MFG. CO.,
CLEVELAND, OHIO



FACTORY OF THE A. O. SMITH CORPORATION,
MILWAUKEE, WIS., EQUIPPED WITH SANYMETAL

Office and Factory Partitions, Type "A"

Bottom Panel—This is made of a heavy gauge single sheet (double insulated if specified), to which are welded a heavy, hollow 6-in. base and 4-in. hollow top rail.

Unit—To each end of the panel is welded a heavy drawn steel channel upright, continuous from floor to height of partition, forming a solid unit. On both sides panels are surrounded by a neat drawn moulding, held in place without screws.

Assembled Units—When set, the sections are butted and securely fastened at each end of floor and ceiling, or at top to continuous cornice if partitions do not extend to ceiling. The joints where sections butt, as well as all fastenings joining them, are covered with a continuous 3-in. moulded trim held by a concealed locking device.



SANYMETAL INSTALLATION
SEYBOLD MACHINE CO.,
DAYTON, OHIO

Top Filler Panels—When glazed sections extend to ceiling, a hollow metal flush panel, adjustable to ceiling, is often used at top.

Cornice—When partitions do not extend to ceiling a heavy cornice is used, designed for strength, beauty and sound deflection. This provides for solid fastening of partition and door sections at top and makes possible the installation of partial partitions, in continuous lengths up

to 20 ft. without lateral or ceiling braces.

Mullions—The unit sections usually range in width, center to center, from 3 ft. to 4 ft. 6 in., uprights of which sections serve as mullions, making glass widths from 32 to 50 in. For smaller lengths, muntins are installed.

Glass Stops—Glass is set in strip rubber, without bolts or putty and fastened from both sides with a continuous drawn moulding, fastening without screws or bolts.

Doors—Doors are made of hollow stiles and rails to which a heavy gauge lower panel is welded, the upper panel being glass or steel. Hardware consists of standard make mortised cylinder lock set and three loose pin butt hinges. Door checks furnished only when specified.

Finish—All metal is thoroughly cleaned with benzine, filled and given a primer spray coat of metal oxide baked on. Partitions can be given an enamel finish either at the factory or after erection. When enameled at the factory, the work is hand rubbed in oil and pumice, producing a fine metal furniture finish. Partitions can also be furnished grained.

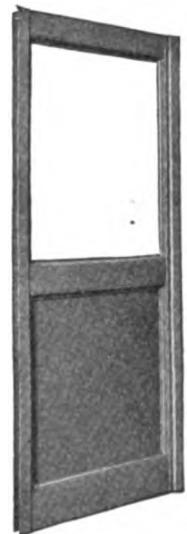
Office and Factory Partitions, Type "B"

Unit Sections—Type B partitions are similar in design, construction and finish to Type A. However, the open channel uprights are telescoped and bolted through, forming a continuous 2-in. square hollow post; 2-in. top and bottom rails are welded to uprights at each end. A heavy gauge sheet is welded between flanges of top and bottom rails and at each end to uprights. The heavy mould is used on both sides surrounding the sheet where it is joined to rails and uprights, concealing all fastenings.

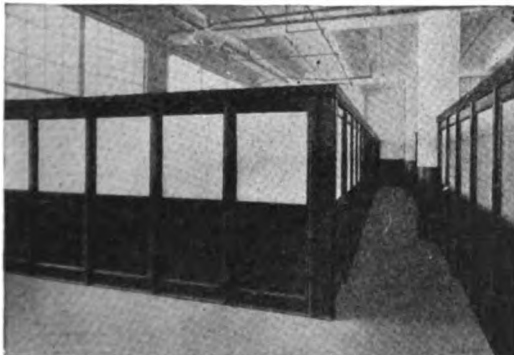
Glazing—For high class work, openings above bottom panels are usually glazed, standard muntins and drawn mould stops being used.

Steel Sash—For ordinary shop partitions, the openings between uprights are often spaced to fit standard steel sash which is set in and bolted through uprights. Wire mesh may be substituted for glass.

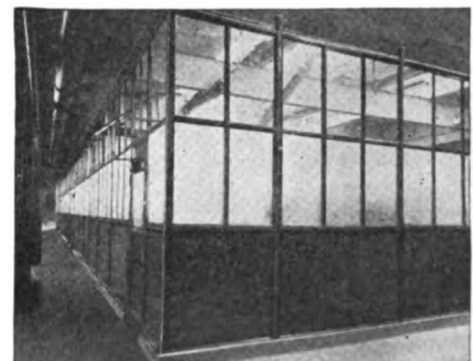
Cost—Installed and glazed, Type B partitions cost little more than wood. They have the advantages of being interchangeable, durable, sanitary, attractive and fire resisting.



UNIT SECTION



SANYMETAL PARTIAL PARTITIONS, TYPE A
LIGGETT & MYERS TOBACCO CO., RICHMOND, VA.



SANYMETAL PARTITIONS, TYPE B
IN THE LORAIN, OHIO, PLANT OF THE NATIONAL TUBE COMPANY

GELINAS ENGINEERING CO., INC.

Sanitary Engineers

529 Courtlandt Avenue
NEW YORK, N. Y.

Products and Sanitary Engineering Service

SELO METHOD of SEWAGE PURIFICATION and DISPOSAL (Patented).

Special attention to all phases of sewage; intensive study of specific problems; compilation of data and furnishing of complete reports together with plans, specifications and estimates.

A Revolution in the Method of Sewage Purification and Disposal

Prior to the advent of the Selo method, no system of sewage purification had been considered a success due to the fact that none properly purified the sewage by destroying germ life and eliminating germ food. Their bacteria-laden effluent was either emptied into streams or allowed to seep into the ground at imminent peril to the public health.

After long experimentation and study, the Selo method was perfected and placed upon the market, fulfilling to the maximum degree all of the requirements of *sanitary* sewage disposal. It produces an effluent devoid of bacteria and germ food and a non-putrescible and easily handled sludge.

Results and Features of the Selo Method of Sewage Purification

The Selo method purifies sewage to any degree desired, *even to absolute potability*. Its bacterial reduction is from 98% to 99% plus and it removes from 95% to 99% of suspended matter.

The effluent is pure, clear, odorless and non-putrescible; it will carry almost 60% of saturation in dissolved oxygen when leaving the plant and will stand at least 14 days at 20° Cent. without decolorizing. The sludge is air dried to approximately 60% water content in 48 hours and is inoffensive and non-putrescible when so dried.

Sludge and effluent are separated and each then receives the treatment required. The sludge (which averages 0.5% in ordinary sewage) receives very intense treatment, while the nearly pure effluent receives comparatively light treatment. It is in this feature that the Selo method goes beyond all former attempts to purify sewage with electrolytic oxygen and registers a *complete success*.

The Selo system can be built in any suitable place to accommodate any flow of sewage. It is not restricted to open localities for fear of bad odors, and it will not attract flies or insects or act as a breeding place for them.

The Selo method requires a very small acreage compared with present day methods and possesses superior advantages both in cost of construction and main-

tenance. Its results are positive; it produces a product of known purity at a fixed and known price.

How the Selo System Operates

The sewage enters a measuring chamber where a float operates the automatic control of chemical and electricity, the amount of each being automatically applied in proportion to the changing flow of sewage.

The sewage passes into the agitating chamber, where it is thoroughly mixed with slaked lime and then flows into the separating tank. The mixture of lime with the sewage causes a dense flocculation of the matter in suspension—that is, the lime causes the matter in suspension to gather together like snowflakes and settle slowly to the bottom of the tank. The movement of the sewage from the center of the tank to the rim is so slow that all matter settles by the time the rim is reached and the water flows over clear of all matter in suspension. The heavy flakes settle to the bottom of the tank where they are drawn into a central sump by slowly revolving arms or scrapers. This sludge is later drawn from the sump for *separate* treatment.

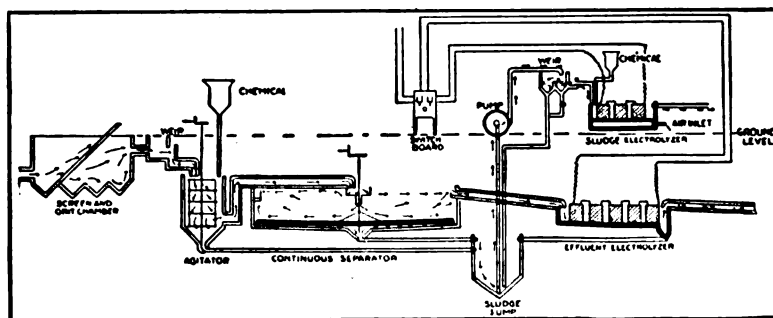
The effluent flows into an electrolyzer, where the final work of purification is performed. The clear sewage passes in thin sheets between the electrodes and is partly broken up into oxygen and hydrogen by passing electric current from electrode to electrode. The oxygen thus liberated is known as nascent oxygen, which attacks with the greatest intensity the organic matters and germs in the clear sewage and virtually burns them up.

A further action of the electricity is to hydrolize the higher and more complex organic compounds that resist direct oxidation and to break them down into simpler compounds that are easily and efficiently reduced by the oxygen present.

The important function of the electrolyzer is the complete sterilization of all bacterial life.

The sludge is treated separately from the effluent. It is pumped from the bottom of the settling tank into an electrolyzer. A solution of common rock salt is added and a current of electricity is passed through it while being thoroughly agitated by compressed air. This treatment generates sodium hypochlorite, a most powerful disinfectant (but not a poison) which kills all germ life present. The sludge is then run on a sand bed, where it dries with great rapidity and is free from offensive odor at any time.

The entire system is continuous in operation, automatically proportioning the current and chemical as required—no technical supervision necessary. Electrolyzers are simple and permanent cells having no moving parts.



ILLUSTRATING THE SELO SEWAGE PURIFICATION AND DISPOSAL PROCESS

PACIFIC FLUSH-TANK CO.

Apparatus for Flushing Sewers and Handling Sewage

149 Broadway
NEW YORK, N. Y.

4241 Ravenswood Avenue
CHICAGO, ILL.

Products

MILLER FLUSH-TANK SIPHONS; FLUSH-TANK REGULATORS; COUNTER METERS.

AUTOMATIC SEWAGE DISPOSAL APPARATUS for Sewage Disposal Plants, either Sand, Contact Beds or Sprinkling Filters.

SEWAGE EJECTORS for lifting sewage.

WATERTIGHT SEWER JOINT COMPOUNDS.

Patents and Scope of Service

The entire line of equipment manufactured by this company is covered by letters patent, and carries a paid-up policy of insurance against failure when set and operated in accordance with this company's instructions.

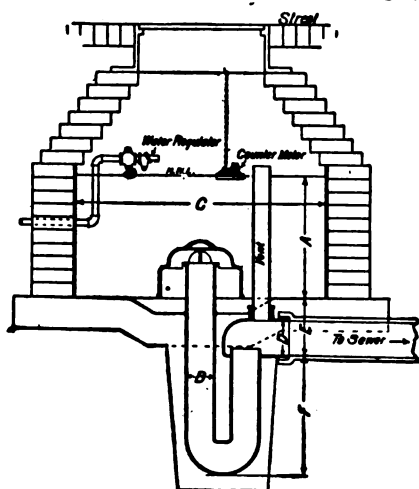
Miller Flush-tank Siphons

The standard design of the Miller siphon consists of two pieces only and operates without moving parts. Miller siphons are manufactured in 4-, 5-, 6- and 8-in. standard design; 5- and 6-in. shallow standard design; 4-, 5-, 6- and 8-in. special design; 5- and 6-in. Miller-Potter design; also single, double and triple alternating siphons for flushing one, two or three sewers from one flush-tank.

Flush-tank siphons are detailed and illustrated in catalogue No. 15.

Flush-tank Water Regulators

These regulators are attached to the water supply pipe inside of the wall of the flush-tank and control the flow of water. They are furnished with different orifices to suit desired



SETTING PLAN OF STANDARD
MILLER FLUSH-TANK SIPHON

FLUSH-TANKS WITH MILLER SIPHONS

Size, in.	Volume of water used each flush		Cost of each flush (water at 20¢ per 1000 gals.)		A	B	C	D	E	F
	Tank ft. in.	Gals.	Tank, ft. in.	Cost, Cents	Drawing depth, in.	Diameter or bore of siphon, in.	Diameter of flush tank, ft. in.	Diameter of discharge head, in.	Distance floor to discharge head, in.	Distance discharge head to bottom of bend, in.
5	3-6	138	3-6	2½	23	5	3-6 to 4-0	6	11	22
	4-0	180	4-0	3½						
6	4-0	235	4-0	4½	30	6	4-0 to 4-6	8	14	30
	4-6	298	4-6	6						

total daily flow, and to operate under the different water pressures as they exist in the flush-tanks.

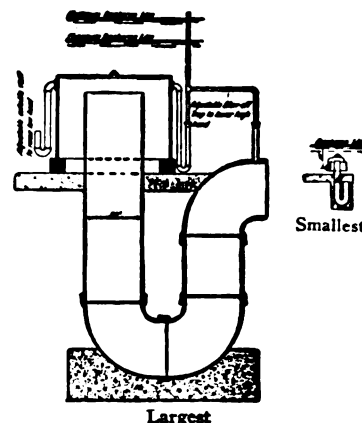
Counter Meters

These counter meters rest on floats and each discharge of the siphon registers one count, thus becoming an accurate meter of the volume used, the siphon drawing the same depth each time.

Automatic Sewage Disposal Apparatus

Manually operated sewage disposal plants are unsatisfactory and generally give poor results.

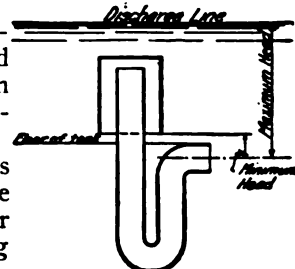
Automatic apparatus, such as this company manufactures, give regular doses at all times to the filter beds, at intervals regulated by the dosing tank in which the apparatus is installed and requires no maintenance other than an occasional cleaning, as there are no moving operating parts. Cut-outs are provided in the contact and sand bed design; in the sprinkling filter design, it is provided with equipment for varying the high and low heads.



MILLER SEWAGE SIPHONS

Engineers designing sewage disposal plants are urged to consult this company in regard to the form of automatic apparatus best suited.

Miller sewage siphons are manufactured in any size from 3 to 30 in. in diameter and for any desired drawing depth. Will operate singly, double or plural as may be required.



SHOWING MAXIMUM AND
MINIMUM HEADS OF
SIPHONS

SIZES OF SEWAGE SIPHONS TO BE USED WITH VARIOUS
RATES OF INFLOW

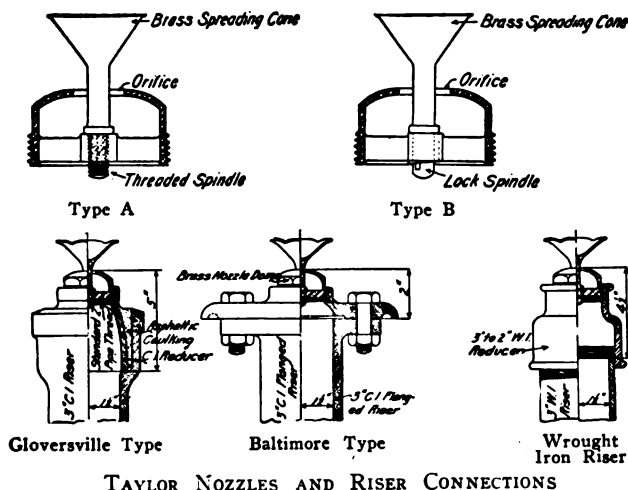
Maximum inflow, gals. per 24 hrs.	Diameter of siphon, in.	Minimum head, in.	Discharge, gals. per min. at minimum head
Up to 100,000	5	6	160
100,000 to 135,000	6	6½	230
135,000 to 280,000	8	7½	450
280,000 to 480,000	10	9½	800
480,000 to 720,000	12	10½	1200
720,000 to 1,070,000	14	13	1780
1,070,000 to 1,465,000	16	14	2440
1,465,000 to 1,925,000	18	15	3210
1,925,000 to 2,540,000	20	17	4230
2,540,000 to 3,860,000	24	19	6430
3,860,000 to 6,360,000	30	22	10600

RATES OF DISCHARGE IN GALLONS PER MINUTE FOR SEWAGE
SIPHONS DISCHARGING INTO AN OPEN TROUGH

Head ft. in.	Diameter of siphon, in.										
	5	6	8	10	12	14	16	18	20	24	30
1-3	255	345	640	1000	1420	1950	2560	3210	3960	5720	8950
1-6	280	375	690	1060	1545	2120	2770	3485	4320	6210	9720
1-9	300	410	750	1180	1675	2300	3010	3780	4680	6740	10530
2-0	320	435	800	1260	1785	2450	3210	4030	5000	7200	11250
2-3	340	460	850	1340	1900	2605	3410	4290	5320	7650	11970
2-6	360	490	900	1420	2000	2760	3610	4530	5580	8060	12650
2-9	380	510	945	1490	2100	2890	3780	4750	5900	8450	13230
3-0	395	535	985	1550	2200	3010	3950	4960	6120	8850	13830
3-3	410	555	1020	1600	2275	3130	4100	5150	6400	9200	14350
3-6	425	575	1060	1675	2370	3250	4260	5350	6620	9550	14930
3-9	440	590	1100	1730	2455	3370	4410	5540	6880	9900	15470
4-0	455	620	1140	1790	2540	3470	4550	5720	7060	10210	15960
4-3	470	635	1170	1840	2610	3580	4690	5900	7310	10520	16440
4-6	485	650	1200	1880	2670	3690	4820	6070	7510	10800	16900
4-9	500	670	1235	1950	2760	3790	4960	6240	7700	11120	17380
5-0	510	690	1270	2000	2840	3890	5100	6410	7920	11430	17870
5-3	520	710	1300	2050	2900	3980	5220	6550	8100	11700	18270
5-6	535	725	1335	2100	2980	4080	5340	6720	8320	11980	18740
5-9	545	740	1365	2145	3045	4170	5460	6860	8500	12250	19120
6-0	555	755	1395	2190	3100	4270	5570	7000	8650	12500	19530
6-3	570	770	1420	2230	3165	4340	5680	7150	8820	12750	19930
6-6	580	780	1450	2280	3230	4430	5800	7300	9000	13000	20340

Taylor Nozzles and Riser Connections for Sprinkling Filters—The sewage after leaving the dosing tank, which is operated by a specially designed dosing siphon, is distributed through the filter by a system of mains and laterals and riser connections to the centers of the nozzles, the orifices of which are usually a few inches above the top of the filter bed, and the sewage is sprinkled over the beds intermittently through the nozzles. These nozzles are standard with 2-in. male thread domes and are attached to various types of fittings for various forms of risers.

All of the apparatus described above is explained and shown in considerable detail in Catalogue No. 14.



TAYLOR NOZZLES AND RISER CONNECTIONS

Automatic Sewage Ejectors

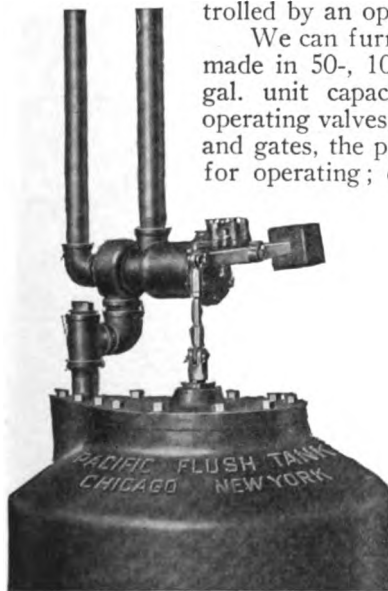
P.F.T. automatic sewage ejectors are manufactured to handle crude, unscreened sewage in volumes up to 1000 gals. per minute and for lifts up to 100 ft. They are of the pneumatic type and are operated by compressors of either the motor, steam or gasoline engine driven type.

Advantages in use over centrifugal devices lie in the fact that no screening is required, as there are no port openings smaller than the diameter of the pipe. As there are no open sumps or wells, the plant is practically odorless.

The P.F.T. ejector is now operated by the new Cox sewage ejector valve of the piston type controlled by an open float.

We can furnish ejectors, which are made in 50-, 100-, 150-, 200- or 250-gal. unit capacity, with foot pieces, operating valves, inlet and outlet checks and gates, the purchaser to provide air for operating; or, if desired, we can furnish complete stations, consisting of compressors, motors, switchboard, air tank, sump pumps, etc.

With several ejectors in different locations, it is more desirable to erect a central air station, piping the air to the ejector stations, which latter may be, and usually are, constructed underground.



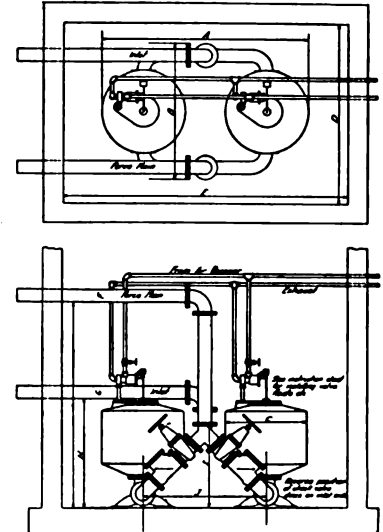
P.F.T. SEWAGE EJECTOR
OPERATING VALVE

Complete ejector stations when designed by us are so arranged that they are practically automatic, requiring little or no attention except oiling and periodical inspection.

In determining the proper size to use, it is well to bear in mind the fact that our ejectors eject their rated capacity per discharge. It takes from 8 to 16 seconds to discharge an ejector, depending on the head and capacity, so it is readily seen that it is possible to secure a higher rate per minute than the nominal capacity. In actual test we obtained 1250 gals. per minute from three 250-gal. machines.

Plant superintendents will find the P. F.T. ejector very useful in lifting fluids whose content would seriously clog and interfere with the operation of a centrifugal pump.

Sewage ejectors are made to operate singly, double or triple for the duty required and are completely described in Catalogue No. 17.



TYPE D-45 DUPLEX SEWAGE
EJECTOR

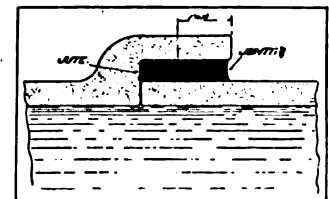
TYPE D-45 DUPLEX SEWAGE EJECTORS
(Dimensions in inches)

Capacity, gals.	A	B	C	D	E	F	G	H	I	J
50	73½	46	25½	98	82	4	4	48	36½	49½
100	95½	63	37½	120	99	6	6	48	39½	57
150	104½	67	37½	129	103	8	8	60	49½	66½
200	113½	77½	47	138	114	8	8	59	49½	66½
250	113½	77½	47	138	114	8	8	66	49½	66½

Watertight Sewer Joint Compounds

To meet the demand for watertight flexible joints in vitrified pipe sewers, this company manufactures Fil-tite and Jointite. When computing total quantity required, allow liberally for waste and differences in the annular space, owing to imperfect moulds and bells. The equipment necessary for laying these joints consists merely of a heating kettle, a few runners and a pouring ladle.

Catalogue No. 12.



METHOD OF USING JOINTITE

APPROXIMATE NET QUANTITIES IN POUNDS PER JOINT
(Compound, 1½ in. deep)

Size, in.	Jointite (105 lbs. per cu. ft.)		Fil-tite (85 to 92 lbs. per cu. ft.)	
	D&W	Std.	D&W	Std.
6	1.46	0.82	1.28	0.72
8	1.82	1.06	1.60	0.95
10	2.26	1.30	1.98	1.15
12	2.65	2.08	2.32	1.82
15	3.20	2.52	2.80	2.20
18	3.75	3.02	3.29	2.64
20	4.30	3.44	3.78	3.00
22	4.62	3.62	4.07	3.16
24	4.91	4.03	4.31	3.50
	Double strength		Double strength	
30	13.00		11.50	
36	23.40		20.50	

JOSAM MANUFACTURING CO.

Double Drainage Floor and Roof Drains

MICHIGAN CITY, IND.

BRANCH OFFICES

NEW YORK, N. Y., 207 East 43rd Street
ST. LOUIS, MO., 317 DeBaliviere Avenue
ALBANY, N. Y., 496 Broadway
BUFFALO, N. Y., 69 Victoria Avenue
BOSTON, MASS., 10 High Street
MONTREAL, CAN., 908 New Birk Building

CHICAGO, ILL., 6167 Leiter Building
CLEVELAND, OHIO, 1104 Prospect Ave.
SAN FRANCISCO, CAL., Merchants Nat'l Bank Building
LOS ANGELES, CAL., 600 Metropolitan Building
PHILADELPHIA, PA.
WASHINGTON, D. C., 4316 15th Street, N. W.

TORONTO, CAN.

Products

JOSAM DOUBLE DRAINAGE DRAINS for Shower Stalls, Floor, Roof, Garage, Hospitals, Swimming Pools, Gutters and Roadway.

Description of Josam Double Drainage Drains

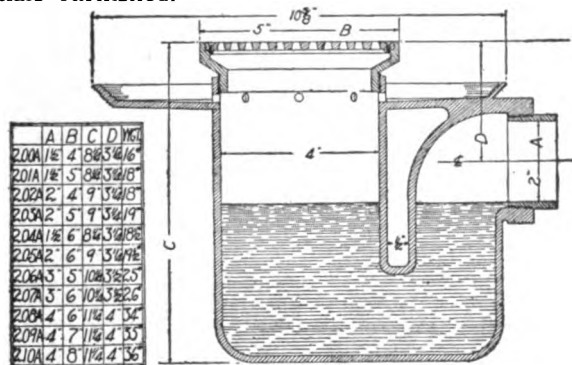
Double drainage drains prevent leakages to ceiling below at points of contact between the metal and floor or roof. Economy in installation. Absolutely trouble-proof. Once installed no further attention is necessary.

All numbers made in cast iron, black or galvanized finish; and all brass, plain or nickelplate finish.

Josam Double Drainage Drain and Trap Combination

200A Series—Heavy cast iron body with adjustable brass strainer to suit floor thickness variations. Regular finish black japan. Galvanized extra. Also furnished in all brass.

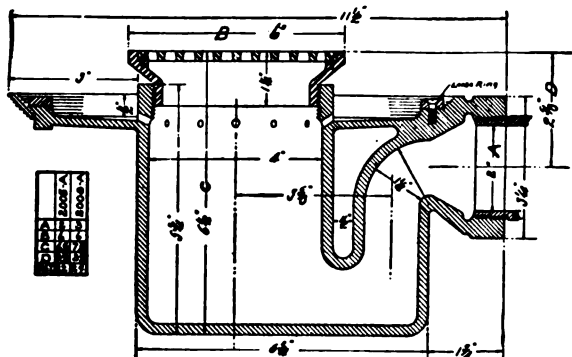
Strainers for porcelain shower receptors and urinals furnished.



200A SERIES DRAIN AND TRAP

No.	200A	201A	202A	203A	204A	205A
Strainer, in.	4	5	4	5	6	6
Outlet, in.	1 1/2	1 1/2	2	2	1 1/2	2
Price	\$10.50	11.50	11.50	12.00	12.50	13.00

No.	206A	207A	208A	209A	210A	211A
Strainer, in.	5	6	5	6	7	8
Outlet, in.	3	3	4	4	4	4
Price	\$15.00	15.00	18.00	19.00	20.00	21.00



2003A DRAIN AND TRAP WITH FLASHING RING AND BOLTS

No.	2003A	2008A
Strainer, in.	6	6
Outlet, in.	2	3
Price	\$18.00	22.00

Made with hub or screw outlet. Galvanized additional.



2003A Special Shallow Type—Same construction as 200A, but designed for shallow installation.

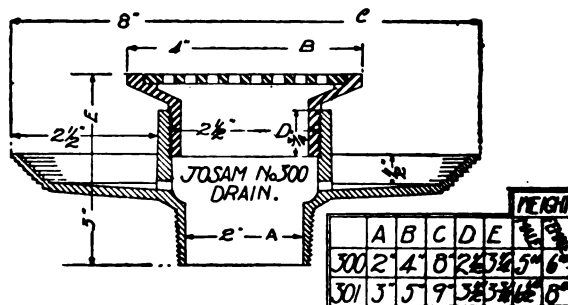
This number comes fitted with flashing ring and bolts to clamp and hold flashing permanently. Also nickelplated brass strainer and adjustable collar.

Josam Double Drainage Drain for Shower and Urinals

300 Series—Without trap, for shower stalls. Body is of cast iron and strainer nickelplated brass.

Can be installed in connection with independent trap to suit construction.

Can furnish either flat, convex or concave nickelplated strainers. Adjustable to variations in floor thickness.



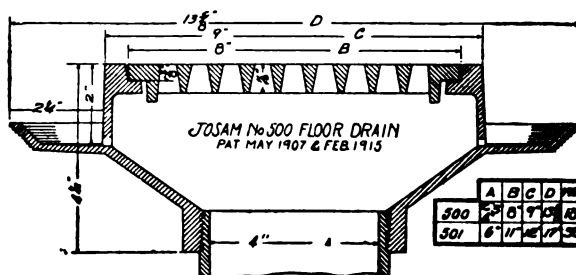
300 SERIES DRAIN

No.	300	301
Strainer, in.	4	5
Outlet, in.	2	3
Price	\$6.80	9.60

Josam Double Drainage Drains or Cesspools

500 Series—For dairy, laundry, warehouse or factory floors.

Made of cast iron with antitilting cast iron grate, or brass grate furnished if desired.

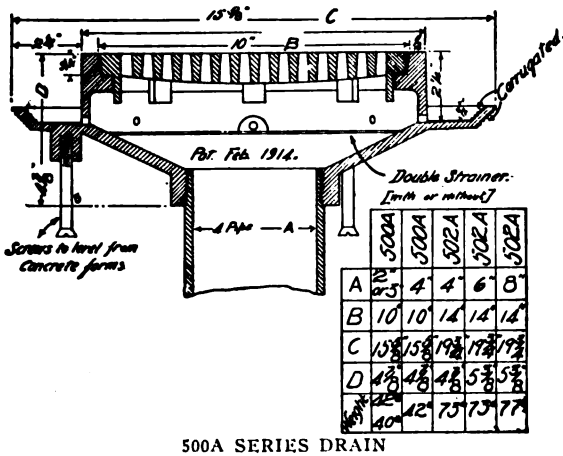


500 SERIES DRAIN

No.	500	500	500	501
Strainer, in.	8	8	8	11
Outlet, in.	2	3	4	6
Price	\$7.50	7.50	7.50	12.00

500A Series—Extra heavy type made of cast iron and especially adapted for packing house, dairy, laundry or cold storage buildings where heavy trucking is necessary, also suitable as garage drains. The supplementary grate is of utmost importance in preventing sewer stoppage.

This series comes equipped with leveling screws for adjustment to suit floor variations. Also has an extra heavy cast iron non-tilting grate 1 in. thick.

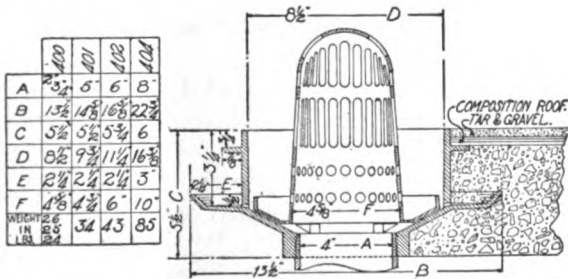


500A SERIES DRAIN

No.	500A	500A	502A	502A	502A
Strainer, in.	10	10	14	14	14
Outlet, in.	3	4	4	5	8
Price	\$10.00	10.50	12.00	14.00	24.00

Josam Double Drainage Drains for Roofs

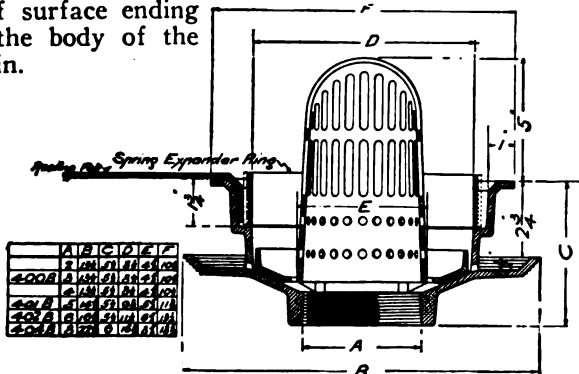
400 Series for Concrete Roof—All roof drains have removable strainer and sediment cup cast integral, to catch gravel, etc., making it easy to remove and clean out. Tapped for standard iron pipe thread. All cast iron. Soil pipe connectors for all sizes and all series of roof drains can be furnished.



400 SERIES ROOF DRAIN

No.	400	400	400	401	402	404
Outlet, in.	2	3	4	5	6	8
Price	\$12.00	12.00	12.00	14.00	16.00	20.00

Improved 400B Series Josam Roof Drain for Concrete Roofs—Construction same as in 400 series with the addition of positive means whereby roofing felts are joined to drain by an expander ring which permanently holds the felts tightly against the inside of a recess formed for that purpose. This renders the use of flashing unnecessary and permits a continuous roof surface ending in the body of the drain.

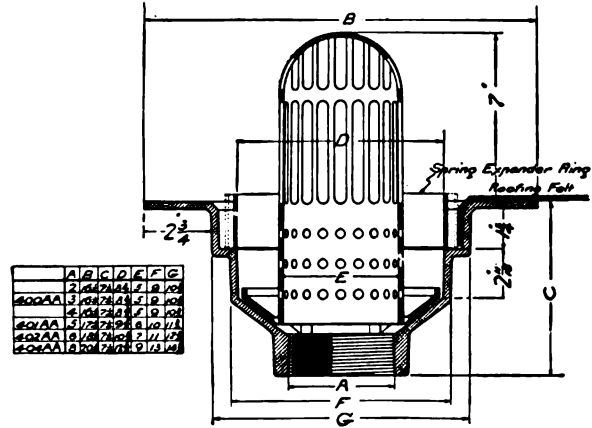


400B SERIES ROOF DRAIN

No.	400B	400B	401B	402B	404B
Outlet, in.	2	3	5	6	8
Price	\$13.00	13.00	15.00	17.00	24.00

Improved Josam Roof Drain with Removable Sediment Cup for Wood or Tile Roof

This series has an easily removable combined sediment cup and dome strainer 2 in. greater in diameter than drain outlet, an expander ring as used in 400B and is made with 3-in. cast iron ledge or flange to carry roof composition. In this series the double drainage cupped flange with weep holes is omitted.



IMPROVED 400AA SERIES ROOF DRAIN

No.	400AA	401AA	402AA	404AA
Outlet, in.	2, 3 or 4	5	6	8
Price	\$16.00	18.00	20.00	28.00

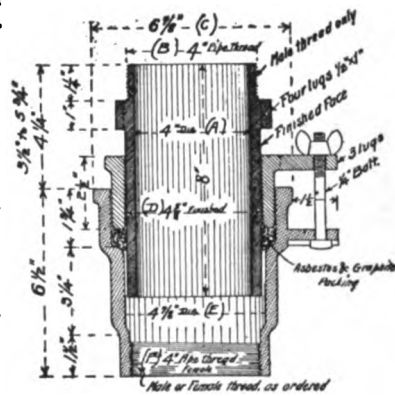
Josam Expansion Joint Connection

PRICE LIST

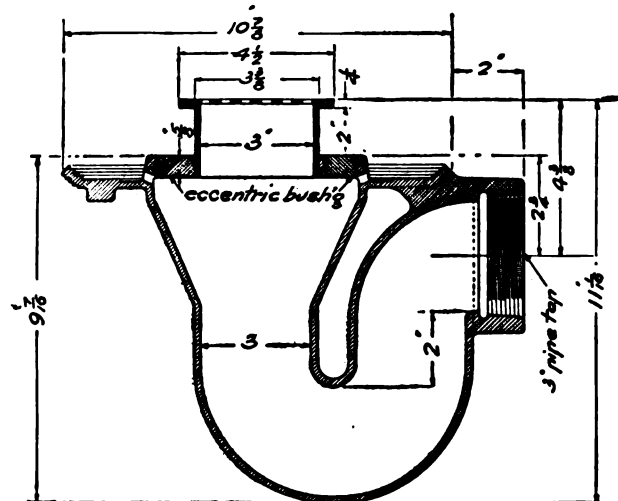
Size of pipe, in.	Price
4	\$ 6.00
5	8.00
6	10.00
8	11.00

Josam Double Drainage Combined Trap and Drain

Equipped with adjustable double eccentric bushings for porcelain, enameled iron, slate or marble urinal and shower receptors. (Patented May 1907 and May 1919.)



EXPANSION JOINT CONNECTION



DOUBLE DRAINAGE COMBINED TRAP AND DRAIN

Can be furnished without trap	
2006A—2 in. outlet	\$14.00
2006A—3 in. outlet	16.00

C. A. DUNHAM COMPANY

Makers of the Dunham Radiator Trap and Other Heating Equipment

GENERAL OFFICES

230 East Ohio Street

CHICAGO, ILL.

FACTORIES: MARSHALLTOWN, IOWA, and TORONTO, ONT., CANADA
EASTERN DIVISION OFFICES: Room 1108, 101 Park Avenue, NEW YORK, N. Y.

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CINCINNATI, OHIO, 414 Provident Bank Building
CLEVELAND, OHIO, 6110 Euclid Avenue
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DAVENPORT, IOWA, 210 Security Building
DENVER, COLO., 512-14 Bank Block
DES MOINES, IOWA, 512 Hubbell Building
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KANSAS CITY, MO., 303 East 10th Street
LOS ANGELES, CAL., 1310 South Hill Street

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PORTLAND, ORE., 410 Board of Trade Building
ROCHESTER, N. Y., 629 Mercantile Building
ST. LOUIS, MO., 1208 Fullerton Building
SALT LAKE CITY, UTAH, 204 Dooly Building
SAN FRANCISCO, CAL., 524 Sheldon Building
SEATTLE, WASH., 2021 L. C. Smith Building
SPOKANE, WASH., 405 Sherwood Building
TROY, N. Y., Rice Building
WASHINGTON, D. C., 710 14th Street, N. W.

CANADIAN PLANT: C. A. DUNHAM CO., LTD.; TORONTO, ONT.

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MONTREAL, QUE., 1904 New Birks Building

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WINNIPEG, MAN., 405 Tribune Building
VANCOUVER, B. C., 625 Standard Bank Building

OTTAWA, ONT., 310 Booth Building

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LEEDS, ENGLAND, Standard Building
LIVERPOOL, ENGLAND, Royal Liver Building
LONDON, ENGLAND, 233A Regent Street, W1

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GLASGOW, SCOTLAND, 60-64 Robertson Street
BELFAST, IRELAND, 4 Ocean Building, Donegal Square, East
PARIS, FRANCE, 64 Rue du Rocher and 47 Rue de la Fontaine-au-Roi
ST. JOHNS, N. F., 160 Water Street

Products

Specialties for use in connection with the DUNHAM SYSTEM of HEATING, known according to its several adaptable forms as the DUNHAM VACUUM SYSTEM and the DUNHAM RETURN SYSTEM, both two-pipe systems; and the DUNHAM AIR LINE SYSTEM.

These Specialties are: The Dunham Radiator Trap; Dunham Packless Radiator Valve; Dunham Blast Trap; Dunham Medium Pressure Trap; Dunham Return Trap; Dunham Reducing Pressure Valve; Dunham Oil Separator; Dunham Strainer; Dunham Air Vent; Dunham Vacuum Pump Governor; Dunham Air Line Valve.

Dunham Heating Service

It is three-fold:

Organization;
Service;
Product.

DUNHAM
HEATING SERVICE

The Company—The Company, and the organization within it, is strong, the largest engaged exclusively in the manufacture of heating specialties and systems.

The Service—This is the Company's strong point. With 52 Branch and Local Sales Offices throughout the United States and Canada, and two complete factories, efficiency service can be rendered. Our Service Departments, with their trained engineers, are at all times ready to co-operate with consulting engineers, architects and contractors, to furnish special details and information instructive as to the best way of installing and using the Dunham products.

The Dunham Products—They are the leaders of their kind, made of the highest grades of suitable materials by especially trained workmen, in clean, sanitary, well ventilated buildings. They are sold through

the responsible heating trade. Each article will be briefly described.

Dunham Radiator Trap

The simplicity of the Dunham Radiator Trap is very apparent. It comprises a body, a cover, and a thermostatic disc which is secured in the cover. There are no loose parts, no sliding contacts, nothing to gum up, and no guide or pin to obstruct the valve opening. There is a flat valve and seat with liberal valve opening. The position and design of the valve is such that it is self-cleaning. The action of the disc is positive, and the valve seats squarely, like a globe valve, the tightest of all types of valves, and one presenting little opportunity for uneven wear. The body is standardized, also the cover and disc, thus giving the further advantages of interchangeable parts.

The function of the Dunham Radiator Trap is to conserve heat, and thus fuel, by keeping radiation and

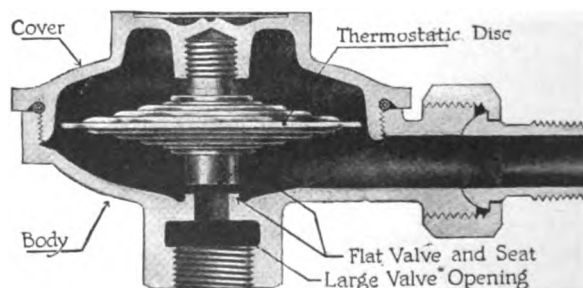


FIG. 1. DUNHAM RADIATOR TRAP

pipng at the point of maximum efficiency. To do this, the working part of the trap, the Dunham Thermostatic Disc, must be and always is fully exposed to the actual

conditions within the radiator, and it therefore responds instantly to any change taking place therein, automatically releasing air and water of condensation and closing to prevent waste of unused steam. It not only saves steam but clears the space which should be occupied by steam from air and water—enemies of high efficiency.

This trap was the first of its kind to be a commercial success, and it has maintained its leadership since 1903. It has therefore stood the test of time.

It is made in 5 sizes, and for steam pressures not to exceed 10 lbs. gage.

The No. 1 and No. 2 traps are for use principally on radiators; No. 3 for large radiators, for pipe coils, and dripping piping; No. 4 and No. 5 for large pipe coils, and dripping steam mains. To determine trap capacity for pipe coils reduce actual surface of coil to equivalent square feet of direct cast iron radiation, the unit in which all traps are rated, by multiplying by $1\frac{1}{4}$.



FIG. 2. DUNHAM No. 4 AND No. 5 TRAP

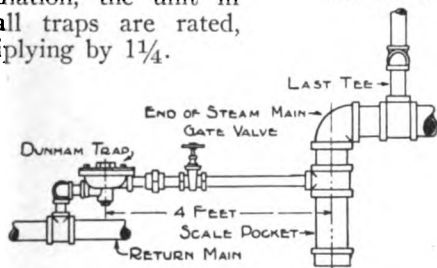


FIG. 3. METHOD OF DRAINING END OF STEAM MAIN IN DUNHAM VACUUM SYSTEM

TABLE A—DUNHAM RADIATOR TRAPS

Size	Pipe connection, in.	Capacity, direct radiation, sq. ft.
No. 1	$\frac{1}{2}$	100
No. 2	$\frac{3}{4}$	350
No. 3	$\frac{1}{2}$	450
No. 4	$\frac{3}{4}$	1500
No. 5	1	3000

Nos. 1, 2, and 3 traps made in angle, straightway, right-hand, and left-hand pattern—all made in brass and bronze; Nos. 4 and 5 in angle and straightway pattern only and made of iron.

Dunham Blast Trap

In design and appearance the No. 6 and No. 7 Dunham Blast Traps are essentially the same as the No. 4 and No. 5 radiator traps, illustrated above. They are designed only for draining blast heating coils. In selecting capacities be sure and reduce blast coil radiation to equivalent direct radiation by multiplying the actual surface of coil by a factor ranging from 6 to 10, depending on temperature, velocity and volume of air blown over coils.

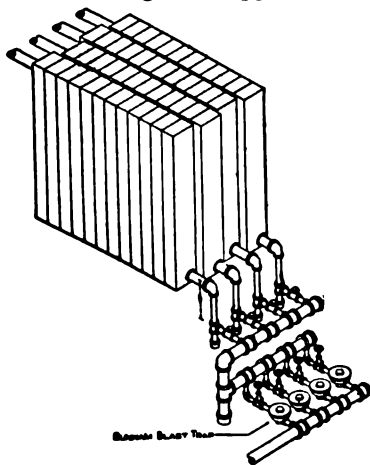


FIG. 4. METHOD OF APPLYING DUNHAM BLAST TRAPS

The No. 8 Dunham Blast Trap is intended for handling large quantities of condensation, and is especially adapted for blast coil work. It combines the Dunham thermostatic principle with the float; it has a double valve and large connections.

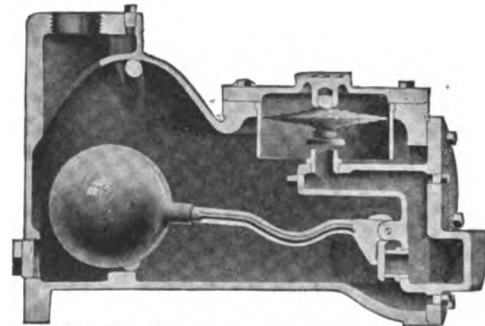


FIG. 5. DUNHAM BLAST TRAP No. 8

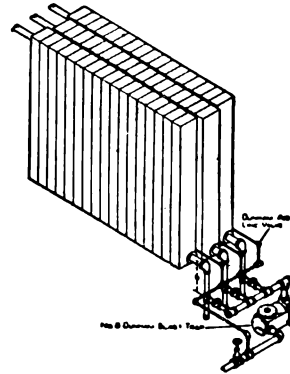


FIG. 6. METHOD OF APPLYING DUNHAM BLAST TRAP No. 8

TABLE B—DUNHAM BLAST TRAPS

Size	Pipe connection, in.	Capacity, direct radiation, sq. ft.	Weight, lbs.
*No. 6	$\frac{1}{2}$	1500	12½
*No. 7	1	3000	21
No. 8	2	12000	75

*Made in angle and straightway patterns.
Made only for pressures up to 10 lbs.

Dunham Air Line Valve

The principle of operation is identical, and design similar, to the Dunham Radiator Trap. Its efficiency is high and service in connection with air line systems invaluable. Can be furnished with either $\frac{1}{8}$ -in. or $\frac{1}{4}$ -in. radiator connection. Air piping is required in connection with its use.



FIG. 7. DUNHAM AIR LINE VALVE

Dunham Return Trap

The Dunham Return Trap is used to separate the air and water discharged into the dry return piping by the Dunham Radiator Traps, to release the air, and to automatically return the water to the boiler without regard to the pressure, if under 10 lbs., carried in boiler or system.

It is a simple, positive acting device, with large valve areas, designed especially for high efficiencies at low heating pressures. Its working parts are protected from dust and dirt, and yet are easily accessible without removing any piping connections.

Dunham Packless Radiator Valve

This is a bonafide packless radiator valve and not dependent upon springs and packing rings. The Dunham disc

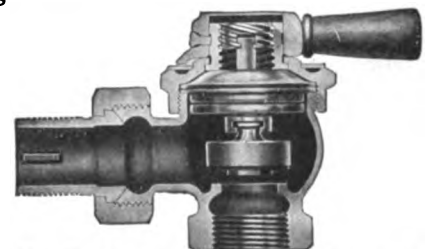


FIG. 8. DUNHAM PACKLESS RADIATOR VALVE

makes this possible. It has a low bonnet and stem and unusual lines, making it attractive in appearance. The valve can be opened or closed in seven-eighths of a turn. It is made only in the angle pattern for use in a top radiator connection. Sizes $\frac{1}{2}$, $\frac{3}{4}$, 1 and $1\frac{1}{4}$ in.

Packless radiator valves are required in all vacuum heating work.

Dunham Reducing Pressure Valve

This product is so well known and universally accepted that no comment is needed. This valve is made only in standard weight for a pressure range of 125 lbs. down—to 10 lbs. on high side, and to atmosphere on low side—in straight and expanded outlet patterns.

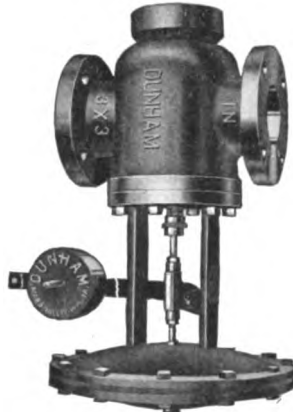


FIG. 9. DUNHAM REDUCING PRESSURE VALVE, STRAIGHT PATTERN

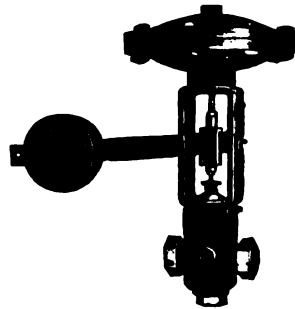


FIG. 10. DUNHAM VACUUM PUMP GOVERNOR

Dunham Medium Pressure Trap, "D" Style

This embodies the principle so successfully used in the Dunham Radiator Trap and is just as simple and satisfactory. It is used almost exclusively in hospitals and kitchens for dripping sterilizers and steam cooking apparatus, where steam is used at a pressure not less than 10 lbs. or more than 50 lbs. gage.

Install at least 4 ft. of connecting piping between the point to be dripped and the trap.



FIG. 11. DUNHAM "D" STYLE MEDIUM PRESSURE TRAP

TABLE C—DUNHAM MEDIUM PRESSURE TRAPS, "D" STYLE

Size	Pipe connection, in.	Capacity, water per hour, lbs.	Weight, lbs.
No. 13	$\frac{1}{2}$	100	4
No. 14	$\frac{3}{4}$	200	15
No. 15	1	400	25

Always state operating pressure when ordering.

Dunham Air Vent

This device is for the purpose of venting air from water that is under pressure.

It is particularly adapted to heating work where the vacuum pump is discharging water of condensation directly back to the boiler.

Capacity for 5000 sq. ft. of radiation.



FIG. 12. DUNHAM AIR VENT

Dunham Oil Separator

The Dunham Separator made for oil separator service is very efficient.

Where exhaust steam is used for heating purposes the heating efficiency of the steam is materially increased by the use of a good oil separator. In fact, with exhaust steam, the use of an oil separator is imperative in best practice.

The Dunham Separator is made in all sizes from $1\frac{1}{2}$ to 10 in., in horizontal pattern only, with flanged ends.

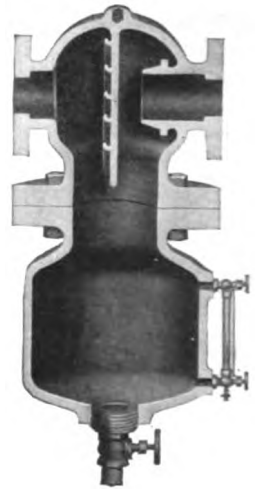


FIG. 13. DUNHAM OIL SEPARATOR

Dunham Strainer

A strainer is a necessity in protecting the vacuum pump from dirt and scale which otherwise might get into it and cause considerable damage. The Dunham Strainer with its large brass screen basket for catching and holding the dirt, and easily accessible for cleaning, at once commends itself for this purpose. It is made in all sizes from 2 to 6 in.; the 2-, $2\frac{1}{2}$ - and 3-in. sizes, with either screw or flanged ends; larger sizes flanged ends only.

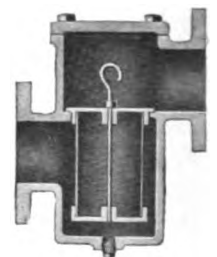


FIG. 14. DUNHAM STRAINER

The Dunham Vacuum System

Since 1903 the Dunham Vacuum System has been a leader and it still stands at the front, easily maintaining its position because of the remarkable success as well as the high efficiency of the Dunham Radiator Trap and allied Dunham specialties.

Simplicity is the leading note of Dunham design. There is the system of steam mains and piping to supply all radiation, and the return piping to carry away the air and water of condensation. Steam may be supplied direct from boiler plant or through reducing valve where boiler pressure is too high (over 10 lbs. gage) for direct service, or exhaust steam may be used supplemented by live steam through a reducing valve.

The returns all converge and grade to the suction inlet of a vacuum pump, which may be either steam or motor driven, automatically controlled, and which may also act as a boiler feed pump. Where exhaust steam is used or where boiler pressure exceeds 20 lbs., the discharge from the vacuum pump should go to a freely vented automatic receiver of a boiler feed pump, the vacuum pump not being used directly to feed the boiler.

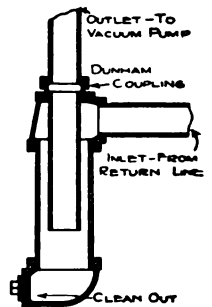


FIG. 15. CONSTRUCTION OF LIFT IN A VACUUM RETURN LINE

How to Specify—Specify the Dunham Vacuum System using Dunham Packless Radiator Valves and Dunham Radiator Traps in the supply and return connection to and from each radiator (use hot water type radiation, preferably), No. 3, No. 4 or No. 5 Dunham Trap for dripping mains, No. 6, No. 7 or No. 8 Dunham Blast Trap for all blast coils, Dunham Reducing Pressure Valve for reducing steam pressure, or automatically supple-

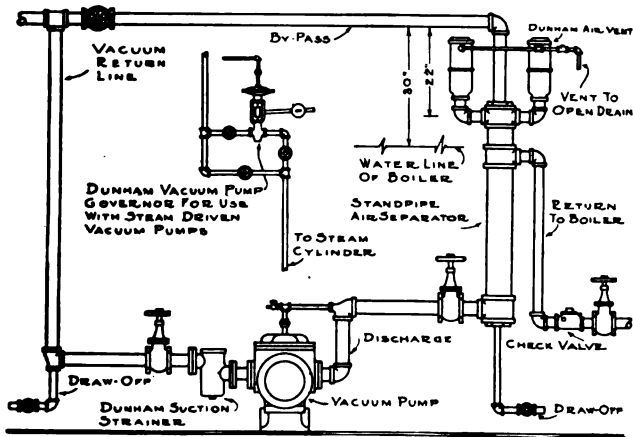


FIG. 16. METHOD OF DISCHARGING DIRECT FROM VACUUM PUMP INTO BOILER

menting exhaust steam, Dunham Oil Separator for removing oil and making exhaust steam suitable for efficient heating, Dunham Strainer for keeping dirt and scale from vacuum pump, Dunham Vacuum Pump Governor for automatically starting and stopping the steam driven vacuum pump to maintain desired amount of vacuum in return piping, and Dunham Air Vent for releasing air from the system; each and all to be installed in accordance with instructions to be supplied by the C. A. DUNHAM COMPANY.

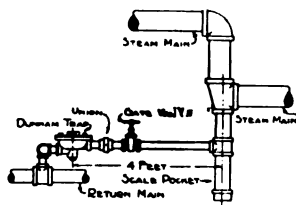


FIG. 17. METHOD OF DRIPPING RISE IN STEAM MAIN, DUNHAM VACUUM SYSTEM

The Dunham Return System

No design for steam heating can be more simple or more easy in operation than this, and coupled with it is the opportunity for high efficiency. Steam is conducted through one system of piping from the boiler to the radiator, where it is retained by Dunham Radiator Traps until it has given off its heat. Then, as water, it passes through the traps, together with the air, and both water and air are conducted through another set of piping back to the Dunham Return Trap, which, independent of the boiler pressure, automatically releases the air out of the system and returns the water to the boiler.

The feature of a positive return under varying steam pressures makes this Dunham System particularly adaptable to apartment houses, small hotels and medium sized commercial buildings, schools and churches. Above all, however, this system makes possible the modernizing of old one-pipe and two-pipe gravity flow systems, materially increasing their efficiency by

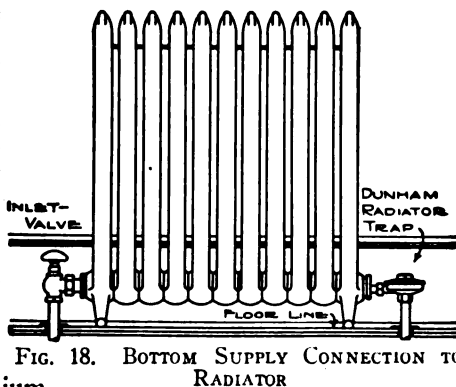


FIG. 18. BOTTOM SUPPLY CONNECTION TO RADIATOR

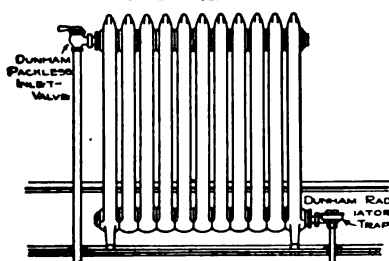


FIG. 19. TOP SUPPLY CONNECTION TO RADIATOR

the introduction of the Dunham Radiator Trap at each radiator, insuring a positive circulation without loss of steam, and permitting the removal of all sputtering, leaking air valves which are such trouble makers in these old heating jobs. During these days when conservation of fuel is of such great importance, this system presents the greatest opportunity for the most efficient and effective use of steam for heating purposes, and therefore will be a fuel saver.

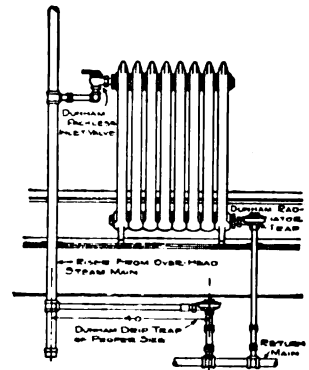


FIG. 20. METHOD OF DRAINING BOTTOM OF STEAM RISER IN AN OVER-HEAD SYSTEM

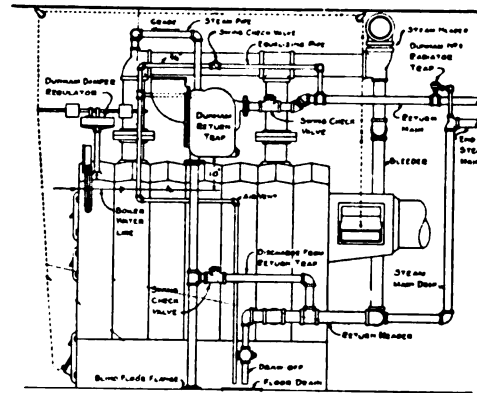


FIG. 21. METHOD OF INSTALLING DUNHAM RETURN TRAP

How to Specify—Specify the Dunham Return System using Dunham Packless Radiator Valves (except in old jobs where inlet connections are at the bottom of radiators) and Dunham Radiator Traps in supply and return connections to and from each radiator, and Dunham Return Trap for releasing air and returning water to the boiler; each and all to be installed in accordance with instructions and standard detail drawings to be supplied by the C. A. DUNHAM COMPANY.

Dunham Air Line System

This is a one-pipe steam system, using a Dunham Air Line Valve on each radiator in place of the usual sputtering air valve, with a system of air line piping which may discharge the air by gravity, or be attached to an air line vacuum pump. This system is particularly adaptable in making old one-pipe heating systems more efficient. Easily and cheaply installed, and insures quick removal of air from radiators.

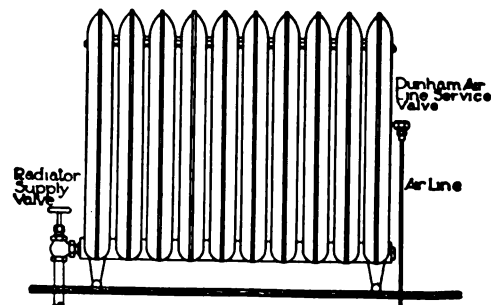


FIG. 22. TYPICAL RADIATOR CONNECTIONS, DUNHAM AIR LINE SYSTEM

Bulletins

Bulletins with detailed information covering all products, including roughing in dimensions, will be supplied on request.

JOHNSON SERVICE COMPANY

Temperature Regulation and Humidity Control

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Products and Services

Manufacturers of THERMOSTATS and Other APPARATUS for the CONTROL of TEMPERATURE and HUMIDITY, including:

Pneumatic Room and Insertion Thermostats and Humidostats.

Electric Room and Insertion Thermostats and Humidostats.

"Syphon" Metal Diaphragm and Rubber Diaphragm Valves.

Low Pressure, Limited Capacity, Electric Air Compressors.

Low Pressure, Limited Capacity, Hydraulic Air Compressors.

Air and Water Reducing Valves.

Pneumatic Switches or Push Buttons.

ENGINEERS and CONTRACTORS for the CONTROL of TEMPERATURE or HUMIDITY for any purpose and over every range used in manufacturing purposes or buildings, furnishing and installing:

Temperature Controlling Apparatus for any and all kinds of heating and ventilating systems.

Temperature Controlling Apparatus for any industrial process requiring the medium of heat.

Control of Humidity in industrial processes requiring artificial humidity.

Temperature Control of hot water tanks and all liquids.

Control of Temperatures of refrigerating and cold storage plants.

Thermostatic Control of electric motors on automatic refrigerating.

Specific Applications of Temperature Control

Bake ovens for enamels, japans, etc.

Core drying ovens.

Drying room for paint, varnish, patent leather, etc.

Storage room for tobacco, rubber or similar goods.

Cold storage rooms, fur vaults, etc.

Canning machinery, cookers, exhausters, processors.

Corn and oats drying apparatus.

Fruit drying apparatus.

Johnson Positive Acting Metal Diaphragm Thermostat

The only thermostat on the market provided with positive snap action for closing and opening the radiator valve quickly, positively and fully, which is necessary with steam heat.

Indicator and Cut-off—

It is the only thermostat having an indicator which shows at a glance whether the thermostat has the heat turned on or off. A cut-off is provided for shutting the heat off permanently when desired.

Johnson Graduated Acting Thermostat

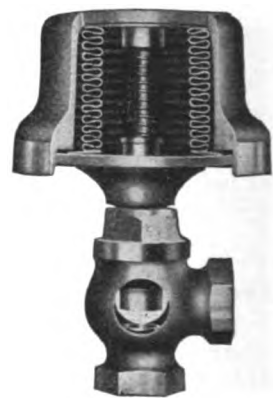
For controlling the temperature of rooms heated by steam, hot blast or hot air furnaces. It controls a mixing damper located at the plenum chamber. The damper, which is furnished, together with the thermostat, etc., is operated by a diaphragm damper motor, connected with the thermostat in such a way that the damper blades will automatically assume the correct intermediate position necessary to deliver the right mixture of hot and tempered air to the room and to maintain a constant and proper temperature therein.

Johnson Electric Room Thermostat

This thermostat is designed and adapted for use in connection with an electric switch, for the control of temperature in electrically heated rooms; for the regulation of temperature in small refrigerators cooled by electrically driven ice machines; for the control of electrically driven centrifugal pumps used for cooling or heating purposes; for the control of motor driven heating, cooling or ventilating fans such as are used in fur vaults, etc.

Johnson Electric Insertion Thermostat

For insertion in brine systems of electrically driven ice machines, to regulate the temperature of brine by the control of the motor; for insertion through wall of refrigerator, to regulate temperature of cooled space by the control of motor; for regulation of temperature in electrically heated



"SYLPHON" METAL DIAPHRAGM VALVE



POSITIVE METAL DIAPHRAGM THERMOSTAT

water system or tank, by control of heater; for regulation of temperature in electrically heated compartment, by control of the heater.



ELECTRIC INSERTION THERMOSTAT

Johnson Pneumatic Insertion Thermostat

Designed to control temperatures within closed air chambers or ducts. The body of thermostat is a dust-proof case containing the two working parts and extending outside the chamber.

This thermostat is made either positive or graduated acting.

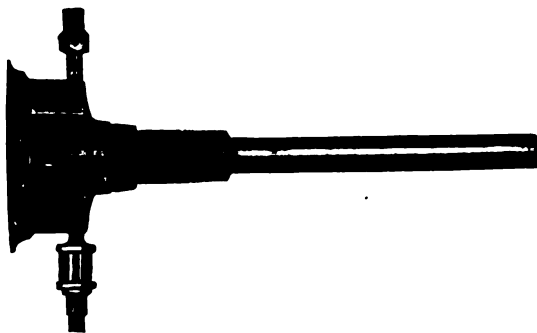
Applications — Adaptable for use in bake ovens for enamels, japans, etc.; drying rooms for paints, varnishes, patent leather, etc.; storage rooms for tobacco, rubber or similar goods; sterilizers or pasteurizers; cold storage rooms, fur vaults, etc.; refrigerator machine control; humidity control for air washers; flue gas temperature control; hot blast heating plants; combination tempered ventilation and hot blast systems; greenhouses, turkish-bath rooms, etc.; tempered ventilation for buildings.



PNEUMATIC INSERTION THERMOSTAT

Johnson Calibrated Thermostat

This is an especially high grade insertion thermostat for use where it is desired to change frequently the adjustment to operate at different temperatures. It is operated by compressed air at 15 lbs. per sq. in., and used to control temperatures of liquids and air by automatically opening and closing a diaphragm valve or damper. Graduations made to meet requirements, limited to a total range of 60° and to minimum space of 2½°.

CALIBRATED THERMOSTAT
Graduated-acting pneumatic type

Pressure Reducing Valves

No. 1—This valve will meet the most exacting service requirements. Being small, well proportioned and having a reasonably large range of action, it is especially

suited for small compressed air or hydraulic machinery. When desired, this valve is provided with a cut-out handle which permits high pressure to instantly pass through the valve without reduction.

This valve is tight when closed, will not let pressure creep up on the low pressure side, and allows free passage of air or water without causing appreciable drop in pressure on low pressure side when valve is subjected to sudden and heavy service.

The materials used are the very best considering durability and utility.

No. 2—Larger and heavier than No. 1 valve; has more parts and therefore costs more. Has a more finished adjusting screw provided with black japanned wood palm piece. Also provided with extra catch bowl at the bottom, with drain plug for catching and removing dirt from valve. In all other respects description of No. 1 valve applies to No. 2.

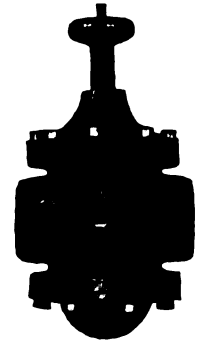
No. 3—A positive shut-off valve, identical in design and construction with No. 2 valve, but built heavier and for larger pipe sizes. Cap screws replace round headed screws on No. 2 valve.

NO. 1 PRESSURE
REDUCING
VALVE

No. 1-A for air
No. 1-W for water

NO. 2 PRESSURE
REDUCING
VALVE

No. 2-A for air
No. 2-W for water

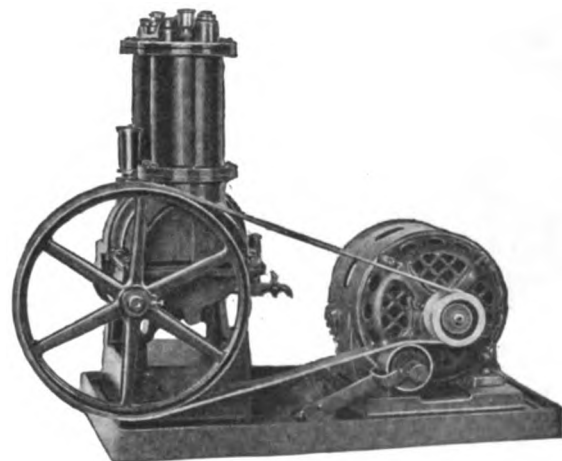
NO. 3 PRESSURE
REDUCING
VALVE

No. 3-A for air
No. 3-W for water

Time Valve Control

Simple device for automatically and periodically opening and closing a diaphragm valve.

Has many applications, such as periodically flushing of toilets, etc. Being simpler and more powerful in action, it is much superior to float tanks. Eight-day clock valve mechanism operates diaphragm valve on water supply by means of compressed air. Valve may be operated from one to four times per hour and for periods of 15 seconds to 5 minutes.

ELECTRIC AIR COMPRESSOR FOR OPERATING JOHNSON
THERMOSTATS

MONASH-YOUNKER CO.

Manufacturers of High Grade Return Line Traps, Air Relief Valves
and Steam Specialties

CHICAGO, ILL.

NEW YORK, N. Y.

Products

MONASH HIGH GRADE RETURN LINE TRAPS, ADJUSTABLE and NON-ADJUSTABLE AUTOMATIC AIR VALVES, QUICK ACTING VALVES; LIQUID THERMO AUTOMATIC AIR VALVES; DRIP LINE AUTOMATIC AIR VALVES, AUTOMATIC STEAM MAIN VENTS, EXPANSION TRAPS, VALVE HOLDERS, RADIATOR COVERS.

Also Packless Supply Valves and Auxiliary Traps.

Trade-mark

Stands for 31 years of quality and service.

No Double Engineering Charge

We do not make plans or specifications for separate installations, hence do not load our price with that overhead cost.

Monash Return Line Traps

These traps are made of the best steam metal and are *guaranteed* for *ten years*.

The *distinctive feature* of Monash traps is the *diaphragm*, a separate and independent unit so held in place that it eliminates all possibility of fracture or rupture. This has always been the greatest source of trouble with thermostatic return line traps, and is overcome with the Monash.

Traps are set and tested at the factory, are *non-adjustable*, and can be shipped with diaphragms removed if so desired to permit a new system to be blown out and cleaned. Temporary caps unnecessary.

Monash No. 40, 42 and 44 Return Line Traps—Made with *by-pass* and *clean-out* feature, making it possible to clean the trap without removing the cover or trap from the system.

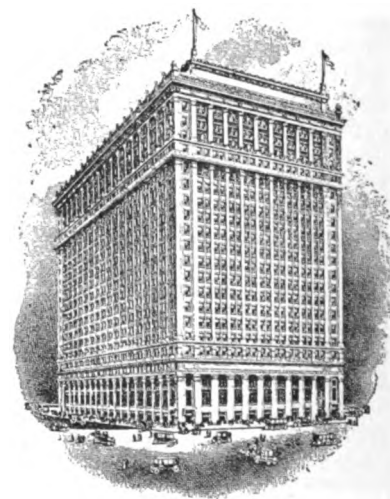
For mains, risers, drips and blast coils in all classes of industrial plants.



Monash No. 35 Return Line Trap—Made without by-pass and clean-out feature. For vacuum and vapor heating systems in apartments, hotels, schools, homes, hospitals and public buildings.

Three thousand three hundred of these particular diaphragm traps have been in use since 1914 in the Continental and Commercial Bank Building, Chicago, Ill. (illustrated below). During that time *not a single diaphragm* had to be exchanged; the upkeep has been *nil*; the efficiency 100%.

We have made many similar installations giving the same results.



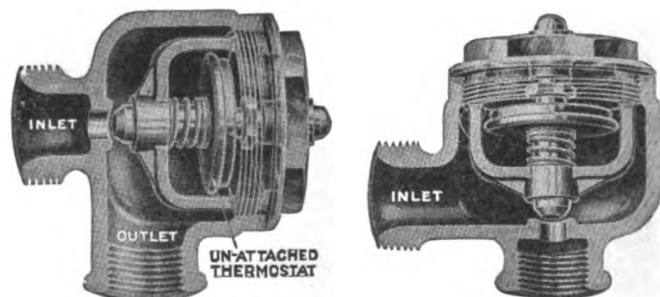
CONTINENTAL AND COMMERCIAL BANK BUILDING, CHICAGO, ILL.
Equipped with 3300 Monash No. 35 Return Line Traps

Traps can be furnished with the diaphragm in either of the positions illustrated below.



No. 40 No. 42 No. 44
THERMOSTATIC RETURN LINE TRAPS

No.	Size, in.	Capacity of direct radiation, sq. ft.	Lbs. water per hour
No. 40.....	$\frac{1}{2}$	350	108
No. 42.....	$\frac{3}{4}$	1500	475
No. 44.....	1	5000	1560



MONASH No. 35. RETURN LINE TRAPS

Monash No. 6 Four-way-drain Automatic Air Valve

This valve has been on the market for more than *twenty years* and is *guaranteed* in writing in the hands of the user for *ten years*. Can only be adjusted with the key which is furnished with the valve. Is the only valve made with a special air tube conducting the air from the radiator, permitting it to escape through the outlet. This equalizes the air pressure in the valve and makes it a perfectly working, automatic, adjustable air valve. The four-way-drain extending from the body of the valve into the radiator drains off the water of condensation, preventing flooding of floors and damage to ceilings below. Made with hexagon shaped base so that it can be distinguished from all other valves.



MONASH No. 6
FOUR-WAY-DRAIN
AUTOMATIC AIR
VALVE

Monash No. 1 Non-adjustable Automatic Air Valve



MONASH No. 1
NON-ADJUSTABLE
AUTOMATIC AIR
VALVE

Made with removable siphon, permitting the valve to be cleaned and the siphon replaced.

The thermostatic member is controlled by volatile liquid, sensitive and quick in action.

Made throughout of heavy metal with the base and nipple cast in one piece and the body of the shell screwed into the base. *Guaranteed for five years.*

Monash No. 27 Quick Acting Valve

Made with $\frac{3}{8}$ -in. connection for use on high points in mains, risers, pipe lines, coils and direct or indirect stacks. Insures rapid steam circulation. Has a thermostatic member controlling its action. Does not close against water. Adjusted and tested at the factory ready for use.



MONASH No. 27
QUICK ACTING
VALVE

Monash Valve Holder



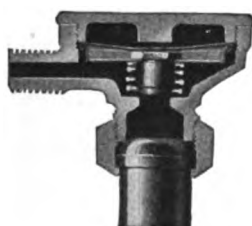
VALVE ATTACHED
TO RADIATOR
WITH MONASH
VALVE HOLDER

Prevents the valve from being turned or removed from the radiator. Especially adapted for use in schools and all classes of public buildings. The accompanying illustration shows the manner of fastening the valve to the radiator with the valve holder.

Monash Liquid Thermo Automatic Air Valve

Used on ventos and air line systems, with or without pump. Non-adjustable. Rapid and positive in action.

No. 2, $\frac{1}{8} \times \frac{1}{4}$ -in. connection.
No. 3, $\frac{1}{4} \times \frac{3}{8}$ -in. connection.

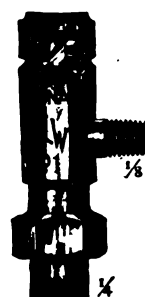


MONASH No. 2 LIQUID
THERMO DIAPHRAGM
AUTOMATIC AIR
VALVE

Monash Telwen Drip Line Automatic Air Valve

The Telwen feature "tells when" valve is properly adjusted, saving time and work due to careless adjustment. Compensating spring seat prevents buckling or bending of expansion member by undue pressure.

No. 1, $\frac{1}{8} \times \frac{1}{4}$ -in. connection. No. 3, $\frac{1}{4} \times \frac{3}{8}$ -in. connection.

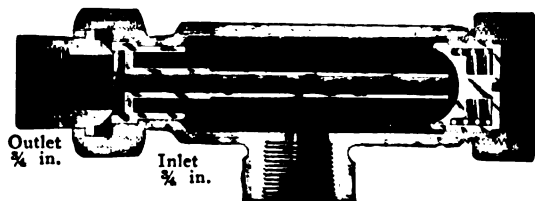


MONASH TELWEN No. 1
DRIP LINE
AUTOMATIC
AIR VALVE

Monash Telwen No. 7 Automatic Steam Main Vent

This valve is a large and powerful expansion air vent made for the purpose of relieving steam mains or risers of air as it accumulates, thereby permitting free circulation of steam. 8 in. long, $\frac{3}{4}$ -in. connections.

The Telwen feature in the valve enables one to see at a glance whether or not the screw binds. Once adjusted, valve is ready for service up to 80 lbs. pressure.



MONASH TELWEN No. 7 AUTOMATIC STEAM MAIN VENT

Monash No. 13 Expansion Trap

This small and simple steam trap is especially made for use on steam heating coils, heaters, steam jackets or other places where a small amount of condensation is to be removed without waste of steam. Length, 4 in.

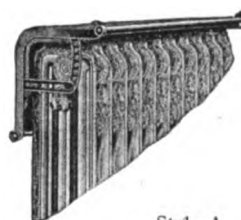
It is perfectly automatic and, when properly adjusted, remains open as long as water escapes, closing when steam strikes expansion post. Used with pressures up to 80 lbs.



MONASH No. 13 EXPANSION TRAP

Monash Adjustable Radiator Covers

Easily attached and easily removed when not in use. These covers prevent the dust stain appearing on the walls above the radiator.



Style A



Style B

MONASH ADJUSTABLE RADIATOR COVERS

Catalogues

Send for catalogues giving more detailed information.

THE STARK SHEET METAL WORKS CO.

Manufacturers of Heat Regulating Devices

418 Second Street, S. E.
CANTON, OHIO

Product

COMBINED DAMPER LOCK, REGULATOR and INDICATOR.

For Roof Ventilators, see page 236.

Perfecto Damper Regulator and Indicator

This indispensable device for heating and ventilating systems positively regulates and controls incoming tempered air and exhaust of vitiated air.

Its distinctive feature is that it locks the dampers in any desired position, thus preventing unauthorized persons from tampering with them.

A glass top, which can only be removed by using a key, permits visibility of the damper at all times.

Indications placed on this glass top designate the rooms to which ducts are directed.

It is easily installed in ducts of any size or shape, concealed or otherwise, and on plastered walls or ceilings regardless of distance from face of wall to duct.

Construction of the Perfecto

The Perfecto damper regulator and indicator is a stamped steel product consisting of four major parts, i. e., two stems fitted to receive standard $\frac{3}{8}$ -in. square damper rods, a case with mechanism to receive indicator attached to one of the stems, and a cover with numbered or lettered glass window.

The cap slides over the case, automatically locking with the aid of a spring catch. This cap must be removed to change position of the damper, and only the authorized person having a key can do this, therefore your system is safe and, being in competent hands, is always efficient.

A Few of Our Latest Installations

University of Buffalo (Chemical Laboratory), Buffalo, N. Y.

Fourth Church of Christ, Scientist, Cleveland, Ohio

Sioux Falls High School, Sioux Falls, S. D.

Miles Standish School, Cleveland, Ohio

Warner School, Cleveland, Ohio

McKinley High School, Canton, Ohio

John Lehman High School, Canton, Ohio

Central Clinic and Hospital, Salem, Ohio

New Hotel Statler, Buffalo, N. Y.

Eastern High School, Norfolk, Va.

Noel State Bank, Chicago, Ill.

Bunte Candy Factory, Chicago, Ill.

Winnetka High School, Winnetka, Ill.

Ottumwa High School, Ottumwa, Ia.

Lincoln School, New York, N. Y.

Niles High School, Niles, Mich.

National Lumberman's Bank, Muskegon, Mich.



Turn Damper to Desired Position



Push Handle Into Slot Which Holds Damper Securely in Position



Slip Cover Over Housing

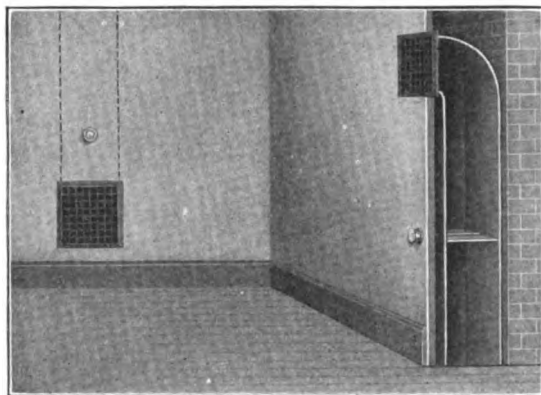


Lock with Key



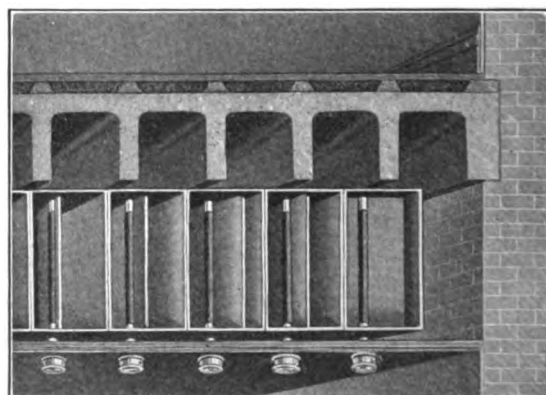
PERFECTO DAMPER REGULATOR AND INDICATOR INSTALLED IN HEATING DUCT

ILLUSTRATING METHOD OF ADJUSTING THE PERFECTO DAMPER REGULATOR AND INDICATOR



Perfecto Damper Regulator and Indicator Placed on Wall Where Ventilating Ducts are Concealed and Damper Connected by Extension of the Square Damper Rod

This arrangement is especially useful in schoolrooms to control inflow of tempered air and exhaust of vitiated air. When damper is set by engineer or janitor, it can not be altered by any one except the person in charge of the heating and ventilating system.



Perfecto Damper Regulator and Indicator Placed on a Battery of Ducts in Collecting Chamber near Machinery Room

Affords an easy and convenient means of regulating flow of air, and also serves as a positive means of indicating room to which each duct leads by means of numbered or lettered cover windows.

TYPICAL INSTALLATIONS OF THE PERFECTO DAMPER REGULATOR AND INDICATOR

P. BANNON PIPE CO.

Manufacturers of Conduits and Expansion Pipe Supports

ESTABLISHED 1852

836 South Thirteenth Street
LOUISVILLE, KY.

Products

Manufacturers of BANNON'S PATENT LIDDED CONDUIT and EXPANSION PIPE SUPPORTS.

Also manufacturers of Sewer Pipe, Hollow Brick, Fire Brick, Glazed Brick, Flue Lining, Hollow Fire-proof Blocks, Paving Blocks.

Bannon's Patent Lidded Conduit

This conduit is a separable, strong, effective, indestructible, vitrified, salt glazed, fire clay and shale product for enclosing iron, steam and hot water pipes (all sizes up to 20-in. outside diameter), single or plural (2 to 7), used for any purpose underground.

Construction—Built in circular or oval form, in separate sections, some of which containing the pipe supports are called rest pieces; each rest piece is used every 10 ft. in line of pipe, and intermediate sections have no ribs or pockets. Each section is divided into upper ("lid") half and lower half. Bannon conduit construction permits rapid assembling on the job, damp-proofing, thermal insulation, drainage and the interior installation of safe, permanent supports of the pipes under any degree of expansion and contraction. For one or more pipe lines the construction of conduit is the same (Fig. 2020).

Salient Features—Heavy conduit wall; reinforced parting lines between the halves of conduit; dipping open scores or grooves; reinforcing ribs with accurately cut pockets for pipe support ends; exterior shelves along parting lines, for holding cement joints; ample drainage space within conduit, etc.

Expansion Pipe Travel—Taken care of by any size of supports, to any degree (0.017 in. to 4 in. or more) required by practice and experience.

Supports—The saddle, cradle, roller, rod and other parts of pipe supports are patented and free from defects. Made in single or double lines according to number of pipes carried. Pipes entirely covered at

supports; enameling of supports prevents electric currents from passing through them to pipes, and supports hold pipe and any kind of pipe covering high and dry in free, dead air space.

Expansion Bend Keepers—Apparatus providing for longitudinal travel of pipe at neck of a pipe bend. Particulars on request.

Sizes of Conduit—Bannon's conduits are made 6 to 30 in. inside diameter with fittings. Length of separable section or rest, 2 ft., 6 to 24 in.; $2\frac{1}{2}$ ft., 30 in.

Installation—Conduit is shipped whole, in rest lengths; rapped into halves on job; lower half laid in alignment and cemented with hydraulic cement; supports are placed, pipe laid and covered; "lid" (upper half) portions are assembled on companion lower halves and heavily cemented at hubs and along parting lines; dipping scores retain waterproofing, open scores facilitate separation of parts; shelves retain cement in position and make a strong joint.

References

Sent on application.

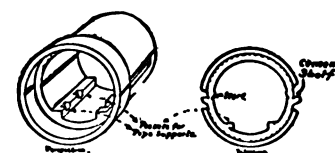


FIG. 70. VIEWS OF A SUPPORT SECTION OF THE CONDUIT
Intermediate sections have no support pocket ribs

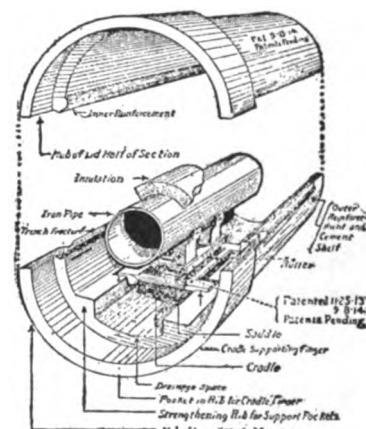


FIG. 75. DETAIL, LIDDED CONDUIT
One support section, separated, with lower half in service position, and upper half (lid portion) suspended to give unobstructed view of section of iron pipe resting in patented expansion supports. Cradle is resting in anchoring pockets made in ribs of conduit

SINGLE AND DOUBLE IRON PIPE LINES "B. P. L. C." WILL CARRY ON COMMON ROD AND PIPE ROLLERS

Conduit, interior diameter, in.	6	8	10	12	15	18	20	24	30
Single line, iron pipe size, in.	2	3	5	6	8	10	12	15 I.D.	20 O.D.
Double lines, iron pipe sizes, in.	1½ and ¾	2 and 1½ 1½ and 1½	2½ and ¾ 2 and 2 2 and 1	4½ and 1 3 and 3	6 and 1½ 5 and 2 4 and 4	7 and 2 5 and 5	8 and 2½ 5 and 5	10 and 3 9 and 5 7 and 7	12 and 4½ 9 and 9

The largest sizes of coupled, standard covered pipe that will go in are given; smaller sizes may be substituted; smaller mains than given on the double lines permit larger returns. Write for further information.

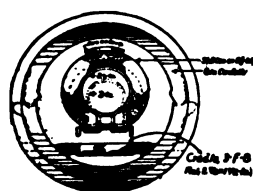


FIG. 8-8 in.

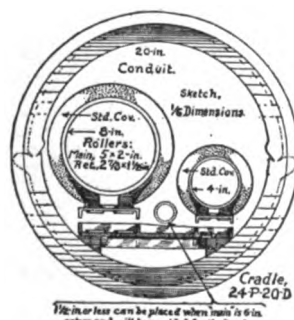


FIG. 2020-20 in.

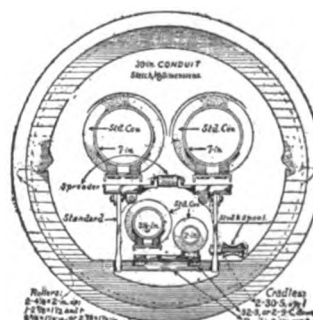


FIG. 30-30 in.

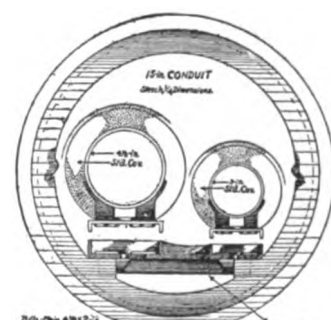


FIG. 1515-15 in.

DETAILS OF LIDDED CONDUITS AND EXPANSION PIPE SUPPORTS

W. H. PEARCE & CO.

Crescent System of Underground Heating

TELEPHONE
STATE 6735

115 South Dearborn Street
CHICAGO, ILL.

Products

"CRESCENT" UNDERGROUND STEAM HEATING SYSTEMS and SPECIALTIES including: Patented Underground Conduit, Expansion Joints, Anchors, Condensation Meters, Traps (L. P. and Vacuum), Tunnel Pipe Brackets and Ball Bearing Pipe Rests.

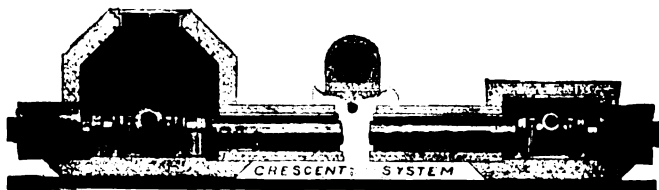
Also other "Crescent" Specialties such as Manhole Curbs, Ball Joints, Wedges, Hot Water Heaters, Vacuum Traps, Radiator Valves (vapor), Angle Joints and Heat Controllers (operated from central plant).

Co-operative Service

We manufacture, engineer and install complete Central Station Heating Systems, rebuild other structures, or furnish the contractor materials and instructions for installing.

Our experience of 25 years in designing and installing underground steam heating systems is of value to engineers, architects and others, who will find it to their advantage to furnish us with plans and other information and allow us to make suggestions and estimates on the "Crescent" system.

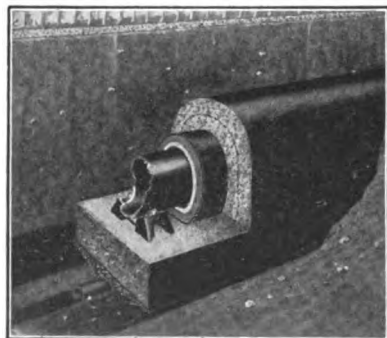
Catalogue furnished on request.



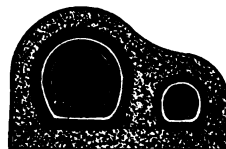
"CRESCENT" UNDERGROUND CONDUIT CONSTRUCTION
Longitudinal view of conduit

"Crescent" Underground Conduit Construction

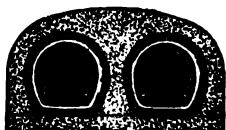
Outer shell is of reinforced concrete, waterproofed on the outside, with gravel and drain pipe underneath. Conduit lining or insulation is of highest insulating qualities; it is germproof and will not fall down or deteriorate with moisture or age; it is sufficiently large to allow a dead air space around the pipe in order to prevent pitting and outside deterioration. Pipe is supported on dirtproof ball bearings, allowing free longitudinal movement independent of insulation, and pipe can be rotated to prevent interior deterioration by condensate.



Cross Section in Ditch
"CRESCENT" UNDERGROUND CONDUIT CONSTRUCTION



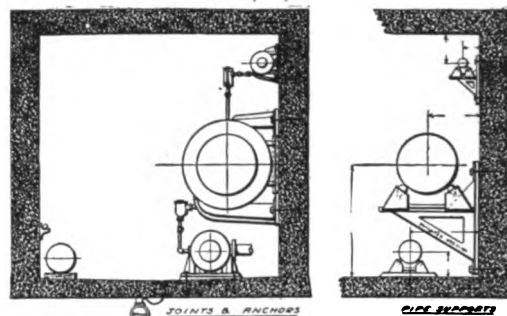
Supply and Return



Hot Water

"Crescent" Construction for Tunnels

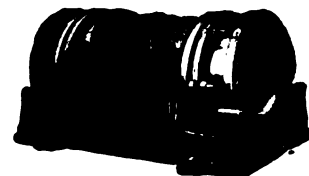
Pipe is supported by "Crescent" pipe brackets which are adjustable and carry the dirtproof ball bearing pipe rests on which tunnel piping may expand and contract with minimum friction. Pipes can be supported on wall or ceiling with our other types of expansion joints, anchors, and pipe rests.



"CRESCENT" CONSTRUCTION FOR TUNNELS

"Crescent" Patented Double Expansion Joints

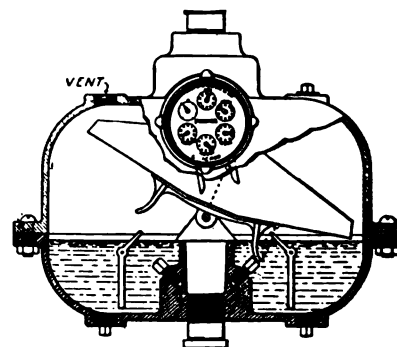
Are set in a sole plate having machined supports for the pipe flanges, securing correct alignment and preventing sticking or strain when in operation. Joints may be rotated in sole plate to meet lateral connections. The enlarged body is a water separator from which condensate may be drained. Joints are guaranteed against leakage or sticking. Anchors are of similar design without the expansion members.



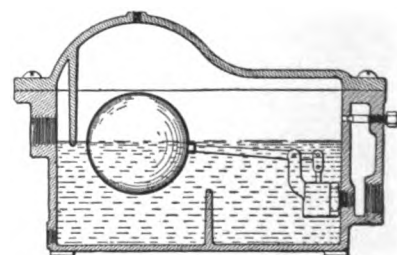
"CRESCENT" PATENTED
DOUBLE EXPANSION
JOINT

"Crescent" Condensation Meters

Will operate under vacuum or atmosphere, are guaranteed not to stick, and are as reliable as a pivoted scale. The copper bucket is adjustable to varied weights. Registering mechanism, contained in separate case, is not affected by scum or grease, for which there is an overflow outlet.



"CRESCENT" CONDENSATION METER



"CRESCENT" STEAM TRAP

THE RIC-WIL COMPANY

Manufacturers of Heat Insulating Products

CLEVELAND, OHIO

Products

RIC-WIL UNDERGROUND CONDUIT and RIC-WIL UNDERGROUND PIPE COVERING used in the "RIC-WIL METHOD" of Insulating Underground Steam and Hot Water Pipes.

RIC-WIL

TRADE-MARK

and strong design, consisting of a malleable iron guide with pockets supporting steel spindles, on which rustproof rollers are free to turn. Guide has a large bearing surface and projecting pins which insure keeping the same in its proper relation to pipes and conduit.

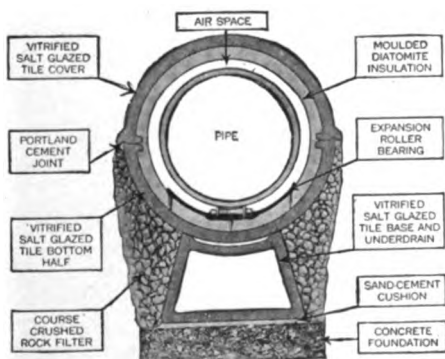
Description

The RIC-WIL METHOD of insulating underground steam and hot water pipes to prevent heat losses, presenting practical advantages in the utility and ease of construction, appeals to every engineer and large steam user. After the trench is dug and the levels determined, it is usual to begin the RIC-WIL METHOD with a concrete foundation on which the base drain is to be laid. The concrete foundation is of such a character that the levels are easily maintained.

Base Drain—The base drain is both a base for supporting and aligning the conduit, and a drain for carrying away the water which might otherwise accumulate around it. It has, in all cases, ample free drainage area and is made the same length as the conduit, but the joints of base drain and conduit alternate, thus making an interlocking construction which preserves conduit alignment. The joints of the base drain are not sealed, but are left open, and crushed rock or coarse gravel is banked up along each side to act as a filter and keep dirt from entering the base drain and thereby prevent drainage by clogging it up. The base drain is connected at various intervals with a sewer or other free outlet. The base drain is the most important single factor in the success of the RIC-WIL METHOD.

Conduit—The conduit is sectional, vitrified, salt glazed tile—the upper half being provided with a projecting lip to protect the longitudinal joint—in which is moulded before shipment a pipe covering of high efficiency, same prepared from a highly siliceous natural mineral. The conduit is readily split lengthwise on the job before installing same. RIC-WIL is the only sectional underground pipe covering manufactured where the waterproof casing and insulation are integral.

Generally, further insulation is provided with RIC-WIL Filler when a steam pipe or a number of pipes conveying fluids at different temperatures are installed in the same conduit. This loose insulating material is packed around the pipe or pipes to entirely fill the hollow space between same and the insulation which is moulded to the inside of the tile. When properly installed, filler will not settle or shrink and is sufficiently elastic not to interfere with free expansion or contraction of the iron pipes. The insulation around the inside of the tile, together with the filler that is inserted, makes a continuous and efficient insulation.

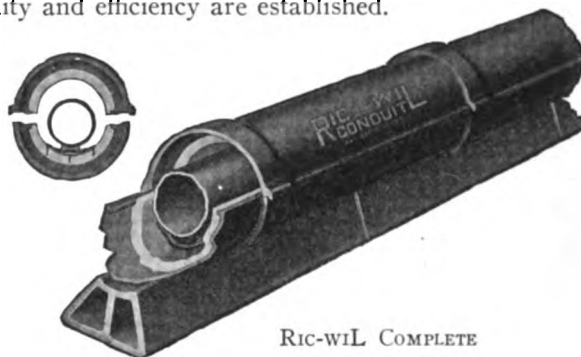


RIC-WIL CLASS DA

Cross section showing principle of construction

Cement—Cement for sealing longitudinal joints of conduit is portland in all cases; the bell joints may be either portland or RIC-WIL Elastic and Waterproof.

Installation—RIC-WIL METHOD is complete; it is the easiest underground system to install and its durability and efficiency are established.



Sizes

Conduits are made in sizes from 4 to 22 in. inside diameter; sizes up to and including 20 in. carried in stock, larger size made to order only. All sections of conduits are 2 ft. 6 in. long, except the 4-in. and 6-in. sizes which are 2 ft. long.

Base drain made in 3 sizes: small for conduits 4 and 6 in. in diameter; medium for conduits 8 to 14 in. in diameter, inclusive; large for conduits 16 in. and up.

Fittings

RIC-WIL insulated fittings are carried in stock in all sizes up to and including 14 in. inside diameter of tile in the form of elbows 45° or 90°, reducers or increasers and tee branches. Larger sizes and other shapes made to order.

Shutters

Specially designed RIC-WIL shutters are used to close the ends of the conduit when entering buildings, manholes and anchor boxes.

Specification Data

In preparing subdivision of heating specifications which embraces conduit and insulation, it is recommended that the engineer communicate with this company in regard to:

Sizes of conduit and standard equipment therefor, which will allow installation of certain size pipe combinations required for work contemplated. State conditions under which pipe system is to be operated, whether steam, hot water or oil transmission; and if the former, state pressure and if any superheat is to be carried, and, if so, how much. It would be well to state clearly kind of service for which each pipe is intended and if position of any pipe or pipes is definitely fixed in relation to any other pipes.

With the foregoing information to hand valuable suggestions based on a wide range of observation, contact and experience will be given. Representative will be sent, if desired.

Catalogue

Complete catalogue, which fully describes above and other types of construction, will be sent on request.

THE ARCTIC ICE MACHINE COMPANY

CANTON, OHIO

AGENCIES

NEW ORLEANS, LA., O. J. MORRIS, 429 Carondelet Street
 NEW YORK, N. Y., F. M. ADAY, Suite 470, 50 Church Street
 DES MOINES, IOWA, C. L. PERCIVAL Co.
 PHILADELPHIA, PA., WINKLER ICE MACHINE Co., 1752 North 29th Street
 MINNEAPOLIS, MINN., L. E. POLLARD Co., 423 Fifth Street, South
 CIENFUEGOS, CUBA, SR. JUAN JOSE HERNANDEZ, Apartado 536
 INDIANAPOLIS, IND., WALTER COX

PENANG, MALAY STRAITS SETTLEMENTS, HEIM & Co.
 KANSAS CITY, MO., BERT INMAN, 507 Shukert Building
 CLEVELAND, OHIO, CLEVELAND ICE MACHINE Co., 2199 Ashland Road
 CHICAGO, ILL., S. W. CALHOUN, 9 South Clinton Street
 SAN FRANCISCO, CAL., BLISS & LYON, 702 Balboa Building
 ATLANTA, GA., O. J. MORRIS, 84 Ridge Avenue
 SEATTLE, WASH., THE ICE MACHINERY Co., 1950 First Avenue, South
 & SONS, 224 South Pennsylvania Street

Products

Manufacturers of ICE MAKING and REFRIGERATING PLANTS, for every purpose from 1-ton capacity upwards, and suitable for connection to any kind of power.

Also the following:

Drop Forged Steel Ammonia Fittings, for high pressure work.

Ice Plant Supplies, for every purpose.

Cold Drinking Water Plants, for large industrial institutions.

Chemical Reclamation Plants, for reclaiming benzol and other volatile liquids in gaseous form for re-use; Chemical Precipitating Plants, where certain soluble chemicals are precipitated into solids at low temperatures.

Oil Cooling Systems, for use in connection with large steel heat treating plants or any other purpose.

Roll Cooling Systems, for the rubber industry.

Large Water Cooling Systems, where the temperature is brought down lower than it can be done by cooling towers, or spray ponds.

Gas Condensers, atmospheric, double pipe, submerged and tube types; Solution and Gas Coolers, in styles best adapted to the particular use.

Insulating Material, for every condition.

Heat Exchangers, in all styles: atmospheric, double pipe, submerged, shell and tube.

Pipe Work and Fittings, for every use and pressure.

Arctic Pownall Raw Water System (The Ultimate Plant)

This is the most efficient and up to date ice making plant built in the world. It will produce better ice at less cost than any other.

Power Cost—The current consumption runs from 40 to 55 kw. hours per ton of ice produced, and the current usually costs from $\frac{3}{4}c$ to $1\frac{1}{4}c$ per kw. hour.

This covers everything, including lights and pumping of water.

Labor—Less than one-half as many men on a shift as required by other type of plant. Only one man required on the tanks.

Overhead Expense—Greatly reduced. Insurance is lower. Less chance for fire. Depreciation and repairs greatly reduced on account of modern construction.

Upkeep—Very little, as the wear on motor drive is practically nothing.

Calcium Loss—Virtually eliminated.

The Arctic Junior Line

Made in sizes from 1 to 20 tons daily refrigerating capacity and can be driven by any kind of power. It is simple and sturdy, requiring a minimum of attention as it is of the splash oiling type. All points of wear are fitted with replaceable bushings.

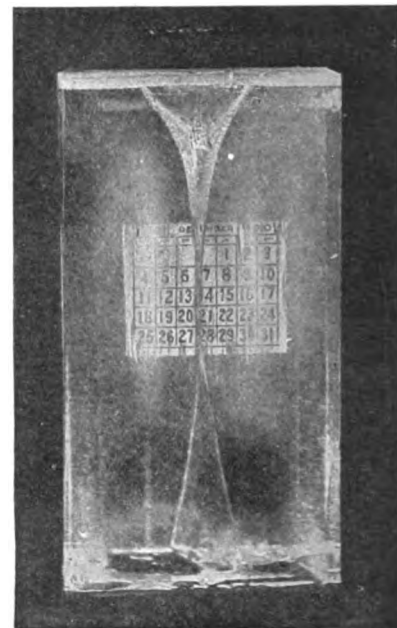
Particularly suited to hotels, apartment houses, small water cooling plants, commissary departments, meat markets and dairies.

Can be fitted to operate automatically.

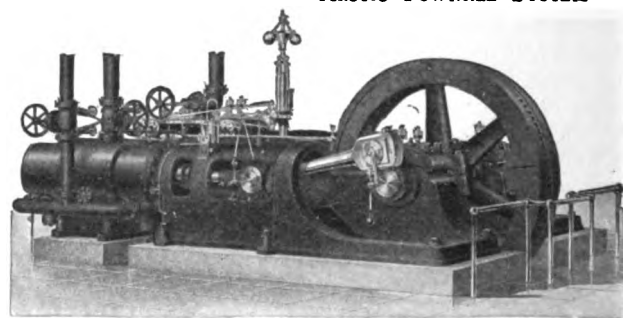
Co-operative Service

THE ARCTIC ICE MACHINE COMPANY specializes in adapting refrigeration to industrial requirements.

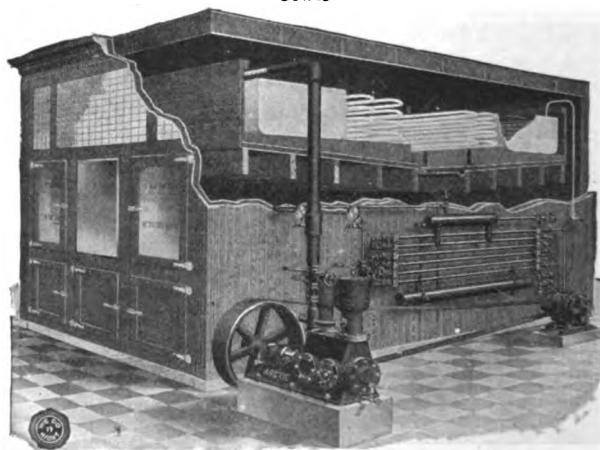
The experience of this organization is at the command of all customers. If in doubt as to the requirements, this company will investigate and guarantee results, advising the most efficient method of removing heat or transferring it from one substance to another.



BLOCK OF "QUALITY ICE" PRODUCED BY ARCTIC POWNALL SYSTEM



ARCTIC HORIZONTAL, DOUBLE-SINGLE ACTING COMPRESSOR
 Suitable for large installations and adapted for driving by any kind of power



SMALL ASSEMBLED REFRIGERATING PLANT

THE AUDIFFREN REFRIGERATING MACHINE CO.

TELEPHONE
RECTOR 5140

90 West Street
NEW YORK, N. Y.

CABLE ADDRESS
"AUDREFMACO"

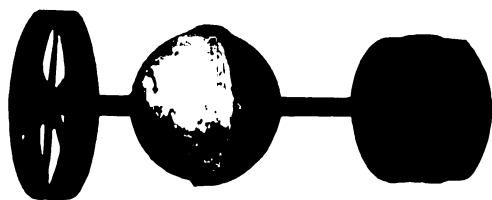
Product

The AUDIFFREN-SINGRUN REFRIGERATING MACHINE.



Description

This machine is so designed that the refrigerant and all refrigerating mechanism is sealed hermetically inside a dumbbell shaped rotor. There are no external screws, glands or valves, there is nothing to adjust or set, nothing can leak and the only requirement to produce cold is to rotate the dumbbell.



THE DUMBELL OR ROTOR

Sizes

Built in four sizes, the capacities and rated performances of each size being given in the following table. Within this range, ideal refrigerating service is available with maximum efficiency and economy.

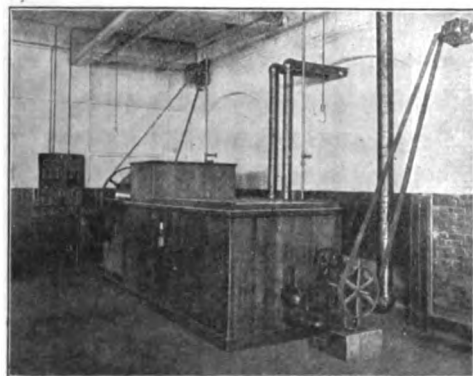
SIZES AND CAPACITIES

No. of machine	Ice equivalent, 24 hours, lbs.	H. p. required	Equivalent Kw.h. per 24 hours	Condensing water at 60°F. required, gal. per hour	Speed of rotor, r. p. m.
2	300-600	1½	12	20	380
3	750-1500	1¾	28	50	280
4	1500-3000	2½	48	100	190
6	3000-6000	5	66	200	140

The above tabulation is for continuous operation, whereas many commercial cold requirements are for operations of 6, 8, 10 or 12 hours operation only. It is good practice to operate these small machines 24 hours a day and store up the cold in brine storage.

Applications

For ice making, refrigeration and cooling of drinking water, in factories, public buildings, residences and clubs. Industrially in creameries, dairies and bottling plants. In heat treating establishments it cools tempering and quenching oils. In rubber factories and paper mills it cools the rolls. For chocolate making and in candy factories the small capacity of this machine is of decided advantage, also in process rooms, glue rooms, film developing rooms, and in making many drugs and chemicals. Compressed air is made dry, clean and free from oil.



No. 6 REFRIGERATING UNIT

Capacities and Performance

The rotor of the Audiffren machine is charged with anhydrous sulphur dioxide, an inert gas, and the entire mechanism, in the form of a dumbbell, controls the cycle of expansion and compression of this refrigerant. One bell of the dumbbell rotates in a tank of condensing water, the other in a liquid to be refrigerated. The liquid cooled may be cooled direct by the rotor, as in quenching oils and drinking water, or the cold may be charged into a calcium chloride brine, which, by means of a brine pump, is delivered to refrigerators, chilling rooms, process boxes or special apparatus.



THE AUDIFFREN SYSTEM

The rotation of the cold bell in the liquid to be refrigerated affords rapid and efficient transfer of cold. Labor is at a minimum, or absent entirely, when by thermostatic control, the operation of the machine is automatic. Machines can be operated with steam power, electric power, water power, or by gas or gasoline engines. Actual ice making capacities are from 200 to 2500 lbs. of ice per day, of refrigerating effect from 300 to 6000 lbs. of ice equivalent per day and of cooling drinking water up to requirements of 2000 persons per day per unit. For milk cooling the four sizes permit of the proper chilling of from 60 to 1200 gals. per day.

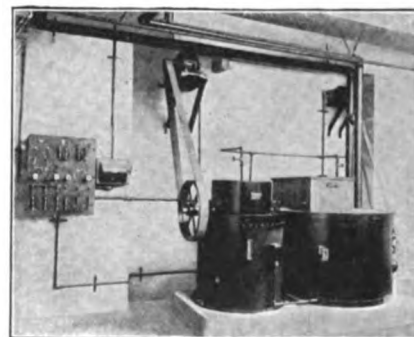
The net capacities of these machines depend on the temperature of the air, that of the condensing water and that of the brine or liquid refrigerated. Such data is desired in figuring on the size of machine to be recommended.

Facilities

The rotors or dumbbells have been built since 1911 at the Fort Wayne Works of the General Electric Co. The tanks, boxes, piping and special equipment, as well as the assembly of the various parts are made at the Audiffren factory in Jersey City, N. J.

Advantages

The A-S machine is absolutely safe. The refrigerant is non-inflammable and non-poisonous. It operates at low pressures and excessive pressures can not be generated under any circumstances. It refrigerates by simply rotating the rotor.



No. 4 DRINKING WATER UNIT

THE AUTOMATIC REFRIGERATING COMPANY

Automatically Controlled Refrigerating and Ice Making Plants

HARTFORD, CONN.

BRANCH, SALES AND SERVICE OFFICES

ATLANTA, GA.
BALTIMORE, MD.
BOSTON, MASS.
CHICAGO, ILL.
CINCINNATI, OHIO

DENVER, COLO.
HONOLULU, HAWAII
HOUSTON, TEX.
HUNTINGTON, W. VA.
JACKSONVILLE, FLA.

LOS ANGELES, CAL.
NEW HAVEN, CONN.
NEW ORLEANS, LA.
NEW YORK, N. Y.
PHILADELPHIA, PA.

ROCHESTER, N. Y.
SAN FRANCISCO, CAL.
SEATTLE, WASH.
WASHINGTON, D. C.

Products

AUTOMATICALLY CONTROLLED REFRIGERATING and ICE MAKING PLANTS (fully patented); AUTOMATIC REFRIGERATED DRINKING WATER SYSTEMS.

Uses for Automatic Refrigerating Plants

Adapted wherever cooling is desired or ice is now used. Particularly desirable for industrial plants, hospitals, office buildings, hotels, clubs, packing houses, dairies, meat markets and residences.

Significance of the Word "Automatic" When Used to Describe a Refrigerating System

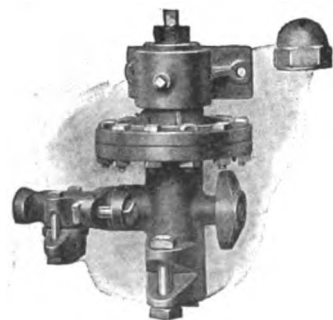
The word "Automatic" applied to any other refrigerating system than the one manufactured by THE AUTOMATIC REFRIGERATING COMPANY of Hartford, Conn., is erroneous. To be "Automatic," the cut-off device of a refrigerating system must, under abnormal conditions, automatically put the plant out of commission, and also automatically restore the thermostatic control when the emergency has passed. Our exclusive patented automatic control, widely recognized for its reliability and positive action, accomplishes this.

Established in 1892, we offer the benefit of our experience to the practical, automatic solution of any refrigeration problems.

"Automatic" Refrigerating System

Minimum Operating Expense—Once installed, no skilled mechanic is required to operate this system. Only an occasional oiling is necessary. We recommend an annual inspection by one of our skilled erecting engineers. In this way the highest efficiency is maintained at minimum operating expense.

What the Plant Consists of—Plant consists of compressor, condenser, coils, oil pump, oil separator and scale trap, thermostat, Automatic expansion valve, Automatic water regulator, Automatic high pressure safety cut-off and Automatic control panel. These parts are of rugged construction, built to accurate dimensions, and are interchangeable and thoroughly tested. All wearing parts are removable and replaceable by duplicate parts shipped from nearest stock.



AUTOMATIC EXPANSION VALVE

The All-important Automatic Parts and Operation—The thermostat controls starting and stopping of motor that drives ammonia compressor, and it functions within 2° or less, thus saving electric power. The Automatic expansion



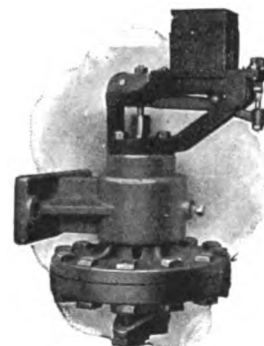
TRADE-MARK

valve keeps ammonia pressure at the most economical point for whatever temperature is desired. The Automatic water regulator maintains the most economical rate of flow of water through condenser. The Automatic high pressure safety cut-off automatically stops machine if a valve is closed by mistake, or there is a variance of water supply, raising the pressure above normal. At the same time a warning bell



AUTOMATIC WATER REGULATOR

is sounded. When conditions become normal, machine is started automatically. The Automatic motor control panel protects and controls the motor. Instead of unreliable fuses, positive acting electric overloads are used, which absolutely protect the motor and save expense and annoyance of renewing fuses. Safety is made just as automatic and certain as the operation of the machine itself.



AUTOMATIC HIGH PRESSURE CUT-OFF

"Automatic" Refrigerated Drinking Water Systems

Improve Health—In industrial plants particularly, the excellent results of the refrigerated water system contributes in a very positive manner to better morale and efficiency and reduces labor turn-over and time lost by sickness.

Save Time—Much time formerly spent in going to and from the drinking place is saved by the installation of any number of bubblers or faucets, all supplied from one drinking water tank cooled by one plant.

Convenience—Assures a positive supply of cool water at a proper temperature when and where desired. No worry about non-delivery of ice; no handling of ice required.

Partial List of Representative Engineers and Architects with Whom This Company Has Worked—

NEW YORK, N. Y.—Donn Barber; Cross & Cross; Delano & Aldrich; E. N. Freidmann; Cass Gilbert; C. P. H. Gilbert; Benjamin Wistar Morris; Werner Nygren; J. F. Jackson.
BALTIMORE, MD.—John C. Bramble.
SPRINGFIELD, MASS.—Fred T. Ley Co.
BOSTON, MASS.—Jackson & Moreland; R. D. Kimball Co.; Lockwood, Green & Co.; Maginnis & Walsh; Parker, Thomas & Rice; Stone & Webster.
LOS ANGELES, CAL.—F. L. Meline.

CARBONDALE MACHINE CO.

Manufacturers of Refrigerating and Ice Making Machinery
CARBONDALE, PA.

BRANCH OFFICES

NEW YORK, N. Y., 171-3-5 Christopher Street
BUFFALO, N. Y., 380 Ellicott Square Building
KANSAS CITY, MO., 1403 Waldheim Building

PHILADELPHIA, PA., 1009 Harrison Building
PITTSBURGH, PA., 1122 Alleghany Avenue
CHICAGO, ILL., 1325 Manhattan Building

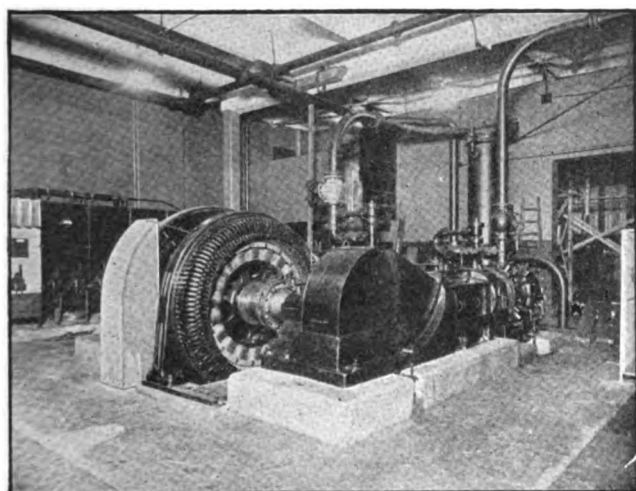
BALTIMORE, MD., 304 Continental Building
LOUISVILLE, KY., 217 Norton Building
NEW ORLEANS, LA., 638 Camp Street

Products and Services

REFRIGERATING MACHINES (Ammonia Compression and Exhaust Steam Absorption systems); PARAFFIN WAX MACHINERY, consisting of Distillate Chilling Machines, Hydraulic Filter Press, Pumping Equipment, Sweating Pans, etc.

Also manufacturers of Ice Making Plants; Steam and Power Aqua Ammonia Pumps; Ammonia Economizers; Brine Coolers; Ammonia Fittings; Liquid Carbonic Acid Gas Plants.

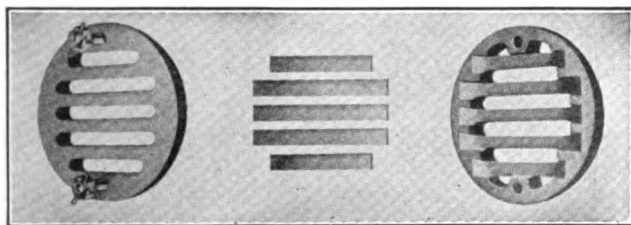
We are prepared not only to furnish these machines but to DESIGN and INSTALL COMPLETE PLANTS.



300-TON, TWO-STAGE COMPRESSOR

Refrigeration

The line of ammonia compressors, together with the "Carbondale" exhaust steam absorption machine, enables us to meet the requirements of refrigeration for any purpose. The compressor used in our ammonia compression system is the Worthington Feather Valve (Reg. U. S. Pat. Off.) Compressor.



WORTHINGTON FEATHER VALVE (REG. U. S. PAT. OFF.)
A vital part in Carbondale compression system

Some Advantages of the Worthington Feather Valve (Reg. U. S. Pat. Off.) Used in Carbondale Compression System of Refrigeration

The steel strips weigh less than a half ounce, making a quiet, durable valve that is in decided contrast to the old heavy, cumbersome types. The valve has no springs, buffer plates or cushioning devices. Seating is by contact—not impact. Pressure on the extremely flexible strips makes the valve tight—no leakage.

We are prepared to furnish Feather Valve ammonia compressors in the following combinations: single cylinder and duplex belt driven; duplex and two-stage direct

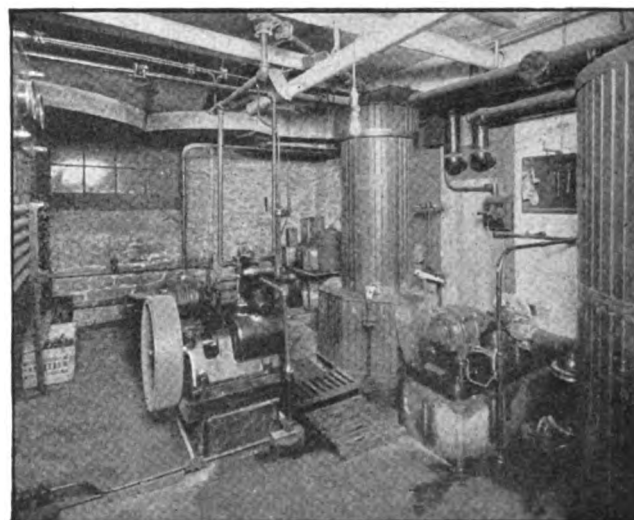
connected to electric motor; and single and duplex steam driven, using slide valve, Corliss, Corliss compound or Stumpf Uni-Flow engine direct connected for operating.

Advantages of Absorption Refrigerating Machines

Will operate with exhaust steam under a slight back pressure. No heavy moving parts. Noiseless. No heavy foundations. Very little attention required. Adapted for any floor space or headroom.

Chilling Machine

Offers the most efficient method of cooling both medium and zero cold test oils.



TWO-TON AMMONIA COMPRESSOR

Filter Press

The Carbondale filter press, having flexible plates, is especially adapted for filtering under high pressure.

It is used for the efficient separation of solids from liquids, such as paraffin wax from petroleum distillates, carbon from coal tar and for other purposes where high pressures are necessary in the operation.

Carbondale Service

At the works in Carbondale, Pa., we maintain a large staff of engineers specially trained in solving refrigeration problems. This engineering service not only creates and designs the features of Carbondale machinery, but also considers exigencies arising in the various plants where installations are to be made, and plans the installation to meet varying requirements of individual plants. Their services are freely offered to engineers, architects and purchasers without charge. The spirit of co-operation evidenced by this department has been a large factor in placing successful installations in such plants as these: E. I. du Pont de Nemours Co.; Chapin-Sacks Mfg. Co.; Buffalo Cold Storage Co.; Equitable Building, New York; Crane & Co.; Armour & Co.; Standard Oil Co.; Ritz-Carlton Hotel, Atlantic City.

Difficult refrigerating problems will be given our closest study, on application from responsible manufacturers.

ESTABLISHED 1867

THE VILTER MANUFACTURING CO.

Ice Making and Refrigerating Machinery, Compressors and Engines

1002 Clinton Street
MILWAUKEE, WIS.

BRANCH OFFICES

NEW YORK, N. Y., 220 Broadway
PHILADELPHIA, PA., 932 Chestnut Street
PITTSBURGH, PA., 314 Curry Building
CHICAGO, ILL., 731 Monadnock Building
SEATTLE, WASH., 106 W. Roy Street
ST. LOUIS, MO., 2723 Bennett Court
ATLANTA, GA., 112 South Gordon Street
DES MOINES, IOWA, 2700 49th Street
WELLINGTON, NEW ZEALAND

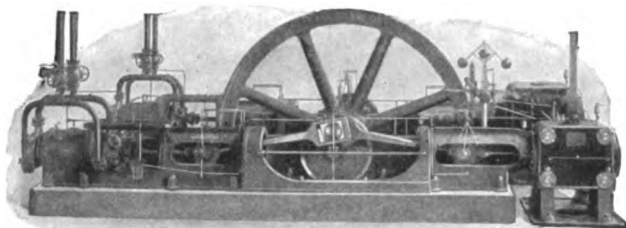
DENVER, COLO., 816 Platte Street
KANSAS CITY, MO., 324 Finance Building
HOUSTON, TEX., 419 Commercial Bank Building
LOS ANGELES, CAL., 2650 Santa Fe Avenue
(Office and Warehouse)
SALT LAKE CITY, UTAH, 28 West Broadway
(Office and Warehouse)
MINNEAPOLIS, MINN., 707 Globe Building
HAVANA, CUBA, O'Reilly 9

Products

VILTER ICE MAKING and REFRIGERATING MACHINERY; AMMONIA COMPRESSORS; PATENTED IMPROVED LOW TEMPERATURE COMPRESSION SYSTEM; POPPET VALVE ENGINES; ROLLING MILL CORLISS ENGINES.

Vilter Duplex Ammonia Compressor

A duplex steam driven unit, with horizontal double acting ammonia compressors and direct connected to cross compound Corliss engine. Compressor equipped with multiple valve heads, giving maximum area. Stuffing box of the double packed type, with oil seal and pressure release.

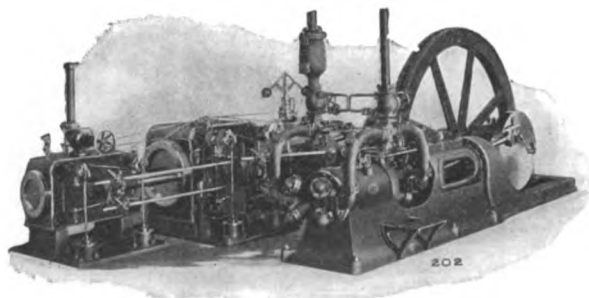


VILTER DUPLEX DOUBLE ACTING CROSS COMPOUND MACHINE

Vilter Single Ammonia Compressor

This type also built with the Vilter poppet valve high pressure steam cylinder, for high steam pressures and superheat. The duplex type is built in sizes from 125 to 800 tons daily refrigerating capacity.

A single heavy duty steam driven unit, direct connected to tandem compound Corliss engine. The design is wonderfully free from complication, and the construction is such as will insure long life, satisfactory service and freedom from trouble. The heavy duty frame is

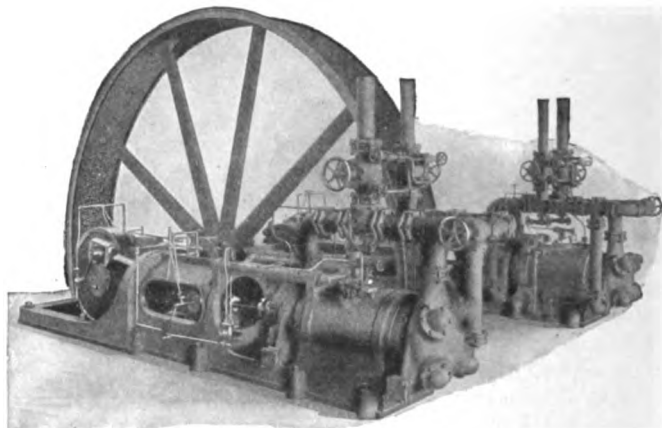


COMPRESSOR DIRECT CONNECTED TO VILTER TANDEM COMPOUND HEAVY DUTY CORLISS ENGINE

designed on straight line principles, of massive construction. The tandem compound engine driven type is built in sizes from 50 to 375 tons daily refrigerating capacity.

Compressor Arrangement for Belt Drive

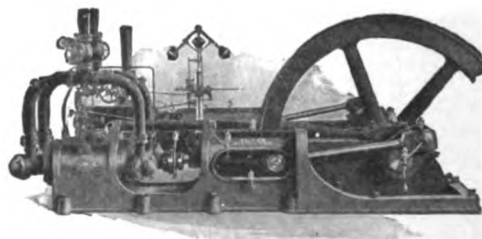
The belt driven machines are furnished in either single or duplex units, and either belt wheels or wheels grooved for rope can be supplied. These units may be driven by any kind of power, such as electric motor, gas or oil engines, etc. Single units are built in sizes from 7½ to 400 tons daily refrigerating capacity; duplex units, in sizes from 15 to 800 tons daily refrigerating capacity.



ROPE DRIVEN DUPLEX COMPRESSOR ROLLING MILL FRAMES

Rolling Mill Type Compressor

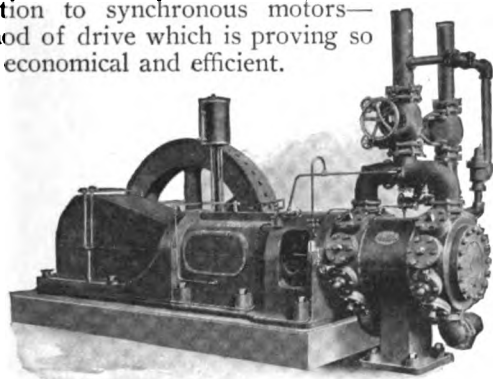
The rolling mill frame machine is built along very heavy lines for all conditions of service. It is used with only slight modifications in all sizes of compressors. Its very appearance gives assurance and proof of its strength and reliability. All parts of the base rest on the foundation, thus giving a uniform distribution of the load and insuring maximum stability and rigidity.



ROLLING MILL TYPE COMPRESSOR

Vilter Horizontal High Speed Ammonia Compressor

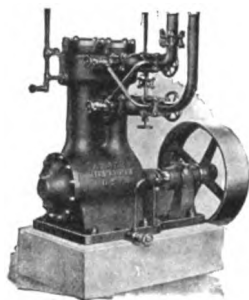
Vilter horizontal high speed ammonia compressors are simple in design, rugged in appearance and in the character of service they give. They are specially designed for direct connection to the newest types of high speed prime movers, and particularly adapted for direct connection to synchronous motors—a method of drive which is proving so highly economical and efficient.



VILTER HORIZONTAL HIGH SPEED AMMONIA COMPRESSOR

Vilter Twin Cylinder Ammonia Compressor

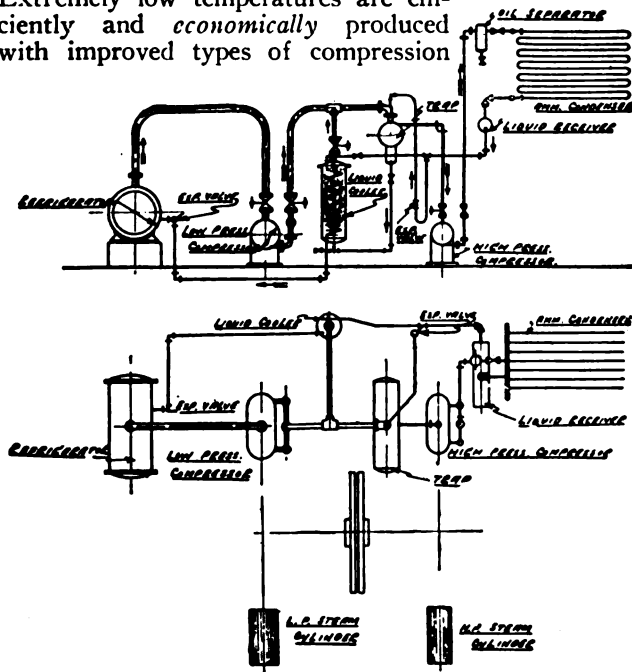
A vertical compressor, specially designed for users of comparatively small quantities of refrigeration. The design unites the base, main bearing and crank case in a single massive casting, cylindrical sections being used throughout, giving simplicity, symmetry and strength, with a very low center of gravity and perfect alignment. Made in sizes from 1 to 20 tons daily refrigerating capacity.



VILTER VERTICAL AMMONIA COMPRESSOR
Small capacity

Vilter Low Temperature Compression System

A system manufactured under D. I. Davis patents. Extremely low temperatures are efficiently and economically produced with improved types of compression



DIAGRAMMATICAL ARRANGEMENT OF LOW TEMPERATURE COMPRESSION SYSTEM

refrigerating machinery superior to the standard compression machine—the latter costs more and its operation is accompanied with several disadvantageous results.

These economically detrimental features are overcome in this system by the following methods:

(1) Multistage compression, which increases volumetric efficiency and reduces the power required for operating the compressors.

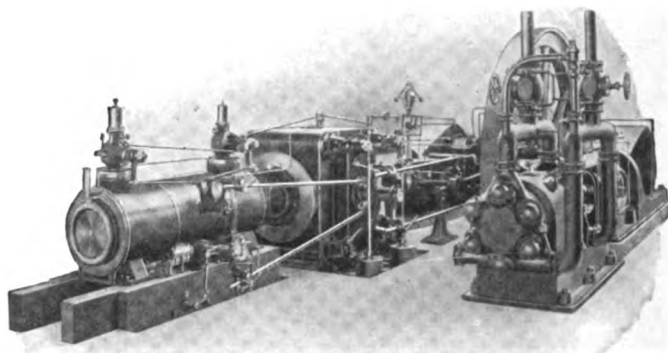
(2) Cooling the liquid before entering the low temperature refrigerator, thus reducing amount of gas handled by low pressure compressor and the power per ton of refrigeration—because the work of cooling is handled by one high pressure cylinder.

(3) Proper traps, etc.

Vilter Tandem Compound Poppet Valve Engine

Vilter tandem compound engine with poppet high pressure and Corliss low pressure cylinder direct connected to rolling mill compressor frame. The most economical combination known, using high pressure superheated steam.

The latest design of Vilter poppet valve engine embodies the very latest developments to accomplish low steam consumption and simple operation.



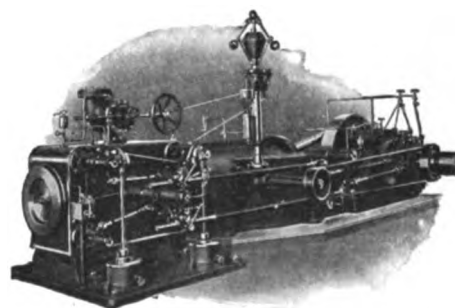
VILTER TANDEM COMPOUND ENGINE

Having poppet valve high pressure and Corliss low pressure cylinders, direct connected to rolling mill type compressor

Vilter Rolling Mill Type Simple Corliss Engine

The rolling mill frame Corliss engine is of exceptionally massive construction throughout; and is adapted to any class of service from the steady belted load to direct connected electrical service, in which the engine is subjected to heavy and extremely variable loads.

This engine is built for high steam pressures, and high rotative speeds, and may be used with superheated steam up to 100° Fahr. superheat. The valve gear is of the high speed type and all valves are double ported. Built in all sizes, either simple, tandem, compound or cross compound.



VILTER ROLLING MILL TYPE SIMPLE CORLISS ENGINE

HENRY VOGT MACHINE COMPANY

INCORPORATED

Manufacturers of Refrigerating Equipment and Drop Forged Steel Valves and Fittings

LOUISVILLE, KY.

BRANCH OFFICES

NEW YORK, N. Y.

CHICAGO, ILL.

TULSA, OKLA.

Products

ICE and REFRIGERATING MACHINERY: EXHAUST STEAM ABSORPTION and AMMONIA COMPRESSION SYSTEMS; EXHAUST STEAM AMMONIA GENERATORS; AQUA AMMONIA PUMPS; DROP FORGED STEEL VALVES and FITTINGS.

For Water Tube and Horizontal Return Tubular Boilers and for Oil Refinery Equipment, see page 489.

Refrigeration

The HENRY VOGT MACHINE COMPANY has for forty-two years manufactured the Vogt absorption ice making and refrigerating machine. Through experience, as manufacturers, the company has developed and improved this machine into the highly efficient product of today. It operates on exhaust steam, which brings operating costs down to minimum. Waste steam in this way becomes a producing power.

The Ingersoll-Rand ammonia compressor is used in the Vogt ammonia compression system for ice making and refrigeration. This compressor, in the estimation of the company, is the best and most efficient ammonia compressor on the market today.

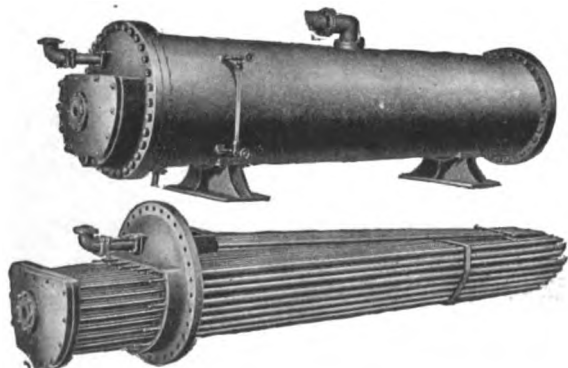
Let us solve your refrigerating problems and aid with our experience in the selection of the type of machine (whether absorption or compression) the conditions of your plant demand.

Vogt Exhaust Steam Ammonia Generator (Patented)

Designed to operate on lowest possible steam pressure.

The shell and heads are made of semi-steel, this metal being the most durable in contact with hot ammonia.

The coil is made of straight extra heavy wrought iron pipe, and each pipe is closed at one end. The steam is delivered through an inside pipe at the closed end and travels only once the length of the generator. This eliminates the friction and enables operation at minimum pressure.



VOGT EXHAUST STEAM AMMONIA GENERATOR (PATENTED)

Vogt

TRADE-MARK

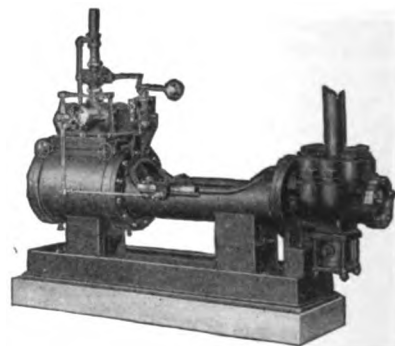
Other special features are: *no* return bends; *no* bent pipes; *no* exposed heating surface; *no* stuffing boxes on steam coils; *no* threaded joints inside of shell.

Vogt Aqua Ammonia Pump

The Vogt aqua ammonia pump is designed to handle strong aqua ammonia. The steam cylinder is equipped with balanced piston type valve, governed by an auxiliary valve that is mechanically operated. The steam consumption is considerably low for this type pump, and the speed is automatically controlled at any desired number of strokes by means of a Mason regulator. The ammonia cylinder is provided with an extra long stuffing box and water chamber.

The ammonia piston rod is made of special steel and connected with coupling to the steam piston rod so it can be easily removed when necessary.

The pump is mounted on a heavy base.



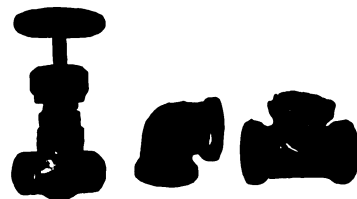
VOGT AQUA AMMONIA PUMP

Vogt Drop Forged Steel Valves and Fittings

These valves and fittings embody every feature and improvement that assures efficient and enduring service. They fulfill the most exacting requirements of high pressures and temperatures of oil, gas, ammonia, air, water, steam, and superheated steam.

Vogt fittings are absolutely guaranteed not to leak when properly installed. They are scientifically forged from open hearth steel of high tensile strength, which makes them proof against shrinkage cracks, blow or air holes, and other defects and flaws commonly inherent in all gray iron, malleable, cast steel, and other cast fittings.

Vogt fittings are bored out of solid forgings and are tapped accurate to gauge. The metal has an average tensile strength of 60,000 lbs. and, being homogeneous, makes a completed fitting that can not break or crack when tightened up. Cracking and breaking of fittings are caused by inferior metal, which is unable to withstand excessive strains. These conditions are absolutely overcome by Vogt fittings.



DROP FORGED VALVE AND FITTINGS

YORK MANUFACTURING CO.

Ice Making and Refrigerating Machinery

MAIN OFFICE AND WORKS

YORK, PA.

BRANCH OFFICES

BOSTON, MASS., 88 Broad Street
 BROOKLYN, N. Y., 42nd Street and 2nd Avenue
 PHILADELPHIA, PA., 2222-28 Arch Street
 PITTSBURGH, PA., 47-49 Terminal Way, S. S.
 CLEVELAND, OHIO, 1106-08 Woodland Avenue
 ATLANTA, GA., 116-18 Central Avenue
 CHICAGO, ILL., 1113-23 Cornelia Avenue

OMAHA, NEBR., 1213-17 Jackson Street

TORONTO, CAN., CANADIAN ICE MACHINE Co., LTD., Villiers and Munition Streets

ST. LOUIS, MO., 117-19 South 11th Street
 DENVER, COLO., 2121-31 Market Street
 HOUSTON, TEX., 2201 Texas Avenue
 NEW ORLEANS, LA., 609 Tchoupitoulas Street
 SAN FRANCISCO, CAL., 832-38 Folsom Street
 LOS ANGELES, CAL., 306-08 Boyd Street
 SEATTLE, WASH., 508 Terry Avenue, North

Products

ICE MAKING and REFRIGERATING MACHINERY, which includes: Compression Refrigerating Machines (Ammonia and Carbon Dioxide), Absorption Refrigerating Machines, Ice Making Plants, Refrigerating Plants, Ammonia Valves, Ammonia Fittings, Ammonia Condensers, Brine Coolers, Aqua Ammonia Pumps, Ice Cans, and all parts needed to equip a complete ice making or refrigerating plant.

Description

We make, in our own factory, all the machinery and apparatus used in ice making and for general refrigeration, both compression and absorption systems.

Compression machines may be actuated by any available power.

Sizes

The enclosed machine is built in sizes from $\frac{1}{4}$ ton refrigerating capacity upward; the vertical single-acting machines from 20 to 600 tons; the horizontal double-acting machines from 10 to 600 tons. Ammonia, absorption and carbon dioxide (CO_2) plants of any capacity required by the trade.

Application

York machines can be used wherever ice making or refrigeration is required, the style of machine being determined, to a great extent, by local conditions.

The enclosed machine is particularly adapted for residences, apartment houses, small hotels, creameries, ice cream factories, etc.

Valves and Fittings

York ammonia valves and fittings are guaranteed to give satisfaction under all usual working pressures.

Service

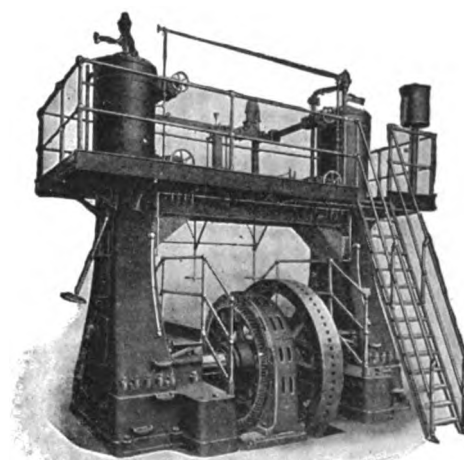
All York agencies carry in stock a complete line of ammonia valves and fittings; also a line of enclosed machines.

What a service department is to the owner of an automobile, the York Sales Organization is to the user of ice making and refrigerating machinery.

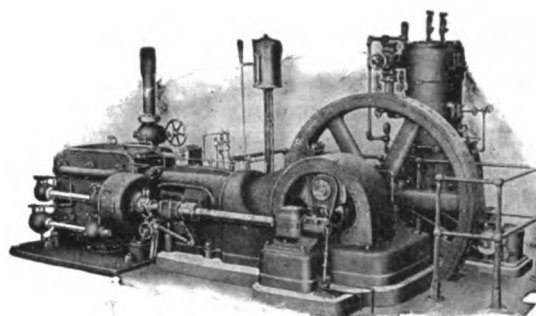
Both quality and service can be secured by patronizing the York Organization.



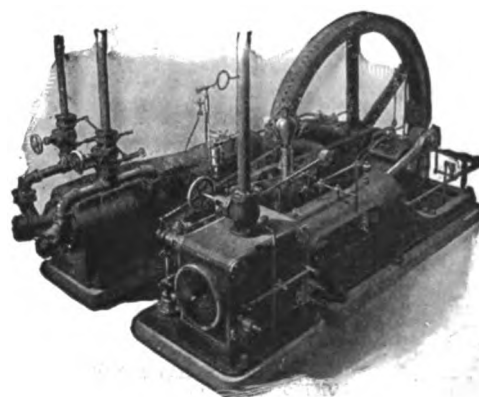
VERTICAL SINGLE-ACTING
ENCLOSED REFRIGERATING
MACHINE



SEMI-ENCLOSED VERTICAL SINGLE-ACTING REFRIGERATING
MACHINE
With direct motor mounting



ENCLOSED SINGLE-ACTING REFRIGERATING MACHINE
Direct connected to Uniflow engine



HORIZONTAL DOUBLE-ACTING REFRIGERATING MACHINE
Direct connected to Corliss valve engine

ARMSTRONG CORK & INSULATION COMPANY

Cold Pipe Covering and Cold Storage Insulation

126 Twenty-fourth Street

PITTSBURGH, PA.

BRANCH OFFICES IN THE LARGER CITIES

Products and Services

NONPAREIL CORK COVERING for brine, ammonia, refrigerated drinking water and all low temperature pipe lines.

NONPAREIL CORKBOARD INSULATION for cold storage plants.

CONTRACTORS for HEAT and COLD INSULATION.

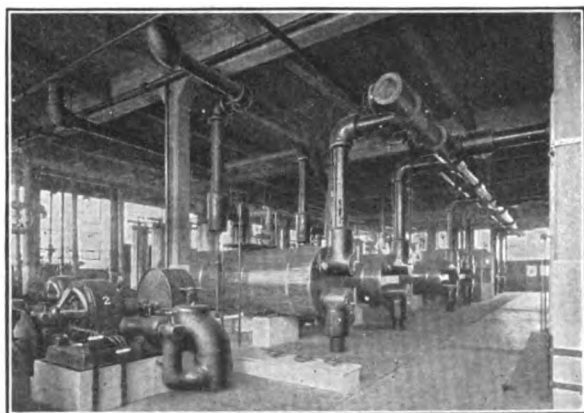
For Nonpareil High Pressure Covering and Insulating Brick, see pages 528-529.

Nonpareil Cork Covering

Nonpareil Cork Covering is made of clean, granulated cork, compressed and baked in molds to fit pipes of the different sizes and the various fittings in general use. No foreign binder is used. The natural gum in the cork wood, liquefied by heat, cements the mass firmly together, and covering each granule with a shellac-like film, renders it practically impervious to moisture. The covering is then coated inside and out with a mineral rubber finish, ironed on. As a result, Nonpareil Cork Covering, properly applied and cared for, will last for many years without deterioration from moisture and frost. It effects a saving of approximately 80% of bare pipe losses, and is the most efficient, durable and economical insulation for low temperature lines.

Nonpareil Covering is supplied in molded covers for practically all screwed and flanged fittings and in 36-in. split sections for straight runs of pipe of the sizes ordinarily used. For the larger sizes, lagging is furnished beveled to the proper radius. Nonpareil Cork Covering is made in three thicknesses—Standard Brine Covering for lines carrying refrigerant between 0° and 25° Fahr.; Special Thick Brine Covering for temperatures below 0° Fahr.; and Ice Water Covering for refrigerated drinking water lines and others where temperatures are above 25° Fahr.

A 64-page book, "Nonpareil Cork Covering," contains complete detailed information and specifications invaluable wherever refrigeration is used. A copy of this book and a sample of the covering will be sent free on request.



NONPAREIL CORK COVERING ON BRINE AND AMMONIA LINES IN THE PLANT OF THE SINCLAIR REFINING COMPANY, EAST CHICAGO, IND.

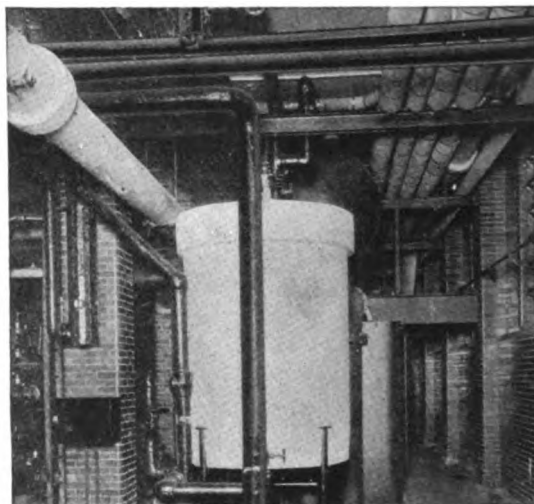
Note clean-cut and substantial appearance of covering on both pipes and fittings

Drinking Water Systems

The refrigerated drinking water system has in recent years become firmly established not only as a modern

convenience, but as a requisite of economy and efficiency in mills and factories, hotels, office buildings and other public and semipublic buildings. Such a system delivers properly cooled water in exactly the quantity required, when and where wanted. It occupies little space, saves time and money, and is clean and sanitary, eliminating the waste and mussiness of the ordinary ice water tank or the "bucket and dipper" method. In manufacturing plants, particularly, the excellent results of the refrigerated drinking water system contribute in a very positive way to improve morale and efficiency, and to reduce labor turnover and time lost by sickness.

Nonpareil Cork Covering in Ice Water Thickness is especially adapted for the insulation of the distributing lines and apparatus. It is neat in appearance, vermin-proof, moistureproof and fire retardant. Its high insulating efficiency insures a minimum use of refrigeration and power, and its durability is a guarantee of long life in service.



REFRIGERATED DRINKING WATER SYSTEM INSULATED WITH NONPAREIL CORK COVERING. HAMILTON COUNTY COURT HOUSE, CINCINNATI, OHIO

Engineering data not available elsewhere are contained in the 48-page book, "Drinking Water Systems," which will be sent on request and without charge. The information regarding water, power and refrigeration required, data on installing the system, approximate operating costs, etc., will be found of unusual value and assistance.

Nonpareil Corkboard Insulation

Nonpareil Corkboard is supplied in boards 12x36 in. and 1, 1½, 2, 3, 4 and 6 in. thick.

The peculiar cellular structure of cork which gives to Nonpareil Corkboard its remarkable insulating value, also serves to protect it from moisture. Nonpareil Corkboard has no capillary attraction. It stays dry and does not rot or mold or deteriorate from any cause normal to cold storage service. Reasonable in first cost, it is, in the long run, the most economical insulation that can be used. Properly erected, Nonpareil Corkboard will last as long as the building.

Samples and literature and further information will be furnished on application.

ESTABLISHED 1848

TOCH BROTHERS

Technical and Scientific Paints, Waterproofing Compounds, Enamels,
Varnishes and Colors

320 Fifth Avenue
NEW YORK, N. Y.

DISTRIBUTING AGENCIES IN THE WORLD'S PRINCIPAL CITIES
WORKS AND LABORATORIES: LONG ISLAND CITY, N. Y.

Products and Services

Inventors and manufacturers of STEEL PROTECTIVE PAINTS; DAMP-PROOFING and WATERPROOFING PAINTS and COMPOUNDS; CEMENT FLOOR COATINGS.

Also manufacturers of Decorative Paints for all purposes; Insulating Paint; Machinery Enamel; Smoke-stack Paint; Roofing Paint; Enamels; Mortar, Cement and Plaster Colors.

A thoroughly equipped chemical laboratory is maintained by us and the services of the chemists are at the disposal of clients who desire paints for special conditions. Correspondence and personal inquiries are invited on technical paint and waterproofing problems.

"R.I.W." Tockolith (Patented)

A Portland cement paint, gray in color, used as a priming coat on iron, steel or other metal. Must be painted over as soon as practicable. Prevents chemical or electrolytic corrosion when used as a priming coat with "R.I.W." Damp-Resisting Paint for finishing.

Approximate covering capacity per gallon (1 coat), 500 to 700 sq. ft.

No. 137 "R.I.W." (Red)

For interior or exterior use as finishing coat over "R. I. W." Tockolith. Resists acid fumes. Endures excessive heat or moisture. Preservative of wood and metal under adverse conditions where acid fumes prevail; on roofs, gutters, tanks, shutters and fire escapes.

Approximate covering capacity per gallon (1 coat), 400 to 600 sq. ft.

"R.I.W." Battleship Gray

United States Navy Standard. Endures excessive heat or moisture. Adapted for molasses tanks, fire escapes and other steel or metal structures. Does not turn white, streak or lose its gloss. Used as a finishing coat over "R.I.W." Tockolith.

Approximate covering capacity per gallon (1 coat), 500 to 600 sq. ft.

"R.I.W." Self-Healing Bridge Cement

Adhesive, elastic, water-proof and alkali-proof. Truly elastic even under low temperature. Requires no skill to apply. Obviates the use of costly treated felts and fabrics. Effective in two-ply and even in one-ply.

Approximate covering capacity per gallon (1 coat), 20 to 40 sq. ft.

"R.I.W." Toxement (Patented)

An integral waterproofing compound which lubricates. Increases workability, plasticity and flowability, renders concrete non-porous, and eliminates the necessity for extreme tamping and vertical chuting. Makes concrete waterproof even under pressure.

No. 421 "R.I.W." Acid-Proof Toxement (Patented)

Special grade of "R.I.W." Toxement, which, when mixed with Portland cement, produces a concrete that withstands action of 50% sulphuric acid.



No. 110 "R.I.W." Damp-Resisting Paint

Black or maroon; waterproof; for painting steel work in factories or laboratories where paint must resist corroding agencies, such as fumes of acids or alkalis. Finishing coat over "R.I.W." Tockolith on grillage work which is to be embedded in masonry. Also railroad bridge floors, column footings, sprinkler pipes, poles and buried pipes.

Approximate covering capacity per gallon (1 coat), 250 to 400 sq. ft.

No. 112 "R.I.W." Damp-Resisting Paint

Similar to No. 110 "R.I.W."; protects steel from elements during erection. Used on brine and condenser pipes, interior iron and wood work subjected to moisture, alkalis, acids or electrolytic action.

Approximate covering capacity per gallon (1 coat), 300 to 500 sq. ft.

No. 49 "R.I.W." Damp-Resisting Paint

Black and dark olive green. Withstands action of locomotive gases, acids and other fumes. Used on bridges, viaducts, fences, fire escapes, tin roofs, lined smokestacks, etc. Can be applied over Tockolith.

Approximate covering capacity per gallon (1 coat), 700 to 900 sq. ft.

"R.I.W." Cement Filler and Floor Enamel (Patented)

"R.I.W." Cement Filler is intended for brush application to dry concrete floors to prevent "cement dusting." "R.I.W." Cement Floor Enamel is applied as a finishing coat where protection and decoration are required. Proof against oil, grease and water. Any color.

Approximate covering capacity per gallon (1 coat), 300 to 400 sq. ft.

No. 2626 "R.I.W." Cement Filler (Transparent)

Priming and finishing coats for concrete floors subjected to severe service. Transparent.

Approximate covering capacity per gallon (1 coat), 300 to 400 sq. ft.

"R.I.W." Acid-Proof Filler

For protecting concrete floors exposed to the action of fat or oils. Apply with brush or broom. May be applied to wet or damp floors. Prevents crumbling.

Approximate covering capacity per gallon (1 coat), 100 to 250 sq. ft.

"R.I.W." Flintox (crystals)

Chemically hardens and dust-proofs concrete floors. May be applied to wet or damp floors.

Approximate covering capacity per gallon (1 coat), 250 to 400 sq. ft.

"R.I.W." Dustop

Transparent floor dressing for dry concrete floors. Resists abrasion to a limited extent, but its main function is that of a dust preventive. Apply with mop, do not paint.

Approximate covering capacity per gallon (1 coat), 200 to 300 sq. ft.

Catalogue

Send for copy of Toch Specification Book.

DETROIT GRAPHITE COMPANY

Makers of Paints in all Colors for all Purposes

DETROIT, MICH.

BRANCH OFFICES

NEW YORK, N. Y.
BUFFALO, N. Y.
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CINCINNATI, OHIO

CLEVELAND, OHIO
GREENVILLE, S. C.
EL PASO, TEX.
ATLANTA, GA.

Products

SUPERIOR GRAPHITE PAINT for structural steel and metal surfaces; ANTI-AQUA, a Dampproof Coating for stone, concrete or brick walls and foundations; STA-WHITE, a pure White Oil Paint for industrial interiors.

Also manufacturers of Degraco-Lite, a White Enamel for interior and exterior; Degraco-Tone, a Flat Washable Finish for interior use on plaster, metal, wood, cement, wall board, etc.; Degraco Concrete Wall and Floor Paint; Degraco Colors for exterior and interior use.

Where Our Products are Sold

DETROIT GRAPHITE COMPANY products are sold through branch offices with warehouse stocks in all principal cities.

Superior Graphite Paint

The base of Superior Graphite Paint is Lake Superior amorphous graphite ore. This ore is a natural combination of graphitic carbon and silica, carrying as well percentages of oxides of aluminum and iron.

Extreme fineness is secured in the preparation of the ore, which is thoroughly ground and mixed with refined and treated linseed oil of highest grade.

Lake Superior graphite ore has a greater affinity for linseed oil than many of the commercial graphites on the market. Proved methods of machine grinding and manufacture make for unusual uniformity of mixture and proper drying qualities. The inert nature of the ore prevents chemical action between pigment and vehicle, and the paint film therefore retains its elasticity and durability over a long period.

Superior Graphite Paint prevents rust action on structural steel, fire escapes, steel window sash, frames and all metal surfaces. Unusual and severe conditions of exposure are met by this paint.

Elasticity to expand and contract with surface on which it is applied prevents cracking and checking of the film.

Large covering capacity, opacity, and ease of application make for initial economy in materials and labor.

Durability (proved in service) results in low ultimate cost.

Superior Graphite Paint has established its reputation as a leader among metal protective paints through service records covering a period of 30 years.

Manufactured in the following colors:

- No. 30 Natural
- No. 32 Brown
- No. 34 Black
- No. 35 Red
- No. 36 Stack Black
- No. 59 Olive Green

Standard Packages: barrels, half-barrels, 5 gals. and 1 gal.



Note: No. 32 Brown is generally used as a shop coat, No. 30 Natural, field coat, and No. 59 Olive Green, final finish coat. This combination of colors facilitates inspection and insures complete coats being applied. Other colors or combinations desired may be used with equal success.

Specification—All scale, dirt and foreign matter shall be removed from structural steel before any painting is done in the shop.

Covered surfaces, surfaces in contact, and surfaces enclosed, of all parts of riveted members, shall receive 1 coat of Superior Graphite Paint No. 32 Brown after pieces are punched and before assembled.

All finished members shall receive 1 complete coat of Superior Graphite No. 32 Brown before taken from shops or exposed to weather. Foundation beams and connections shall receive 1 coat in shop. All bolts used in erection and remaining permanently in structure shall be dipped in Superior Graphite Paint.

All pins and bored pinholes or other planed surfaces shall be coated with white lead and tallow before leaving shop.

All surfaces accessible after erection shall receive 2 coats of Superior Graphite Paint No. 30 Natural and 59 Olive Green, respectively; after being placed in position.

All painting shall be done on dry and preferably warm surfaces.

Paint used shall be Superior Graphite Paint manufactured by DETROIT GRAPHITE COMPANY, Detroit, Mich.

All paint shall be delivered to shop and to erection site in unbroken packages, subject to inspection and approval of engineer and architect.

Repainting Specification—All metal work and other exposed surfaces to be painted shall be thoroughly cleaned with steel brushes, and where necessary all loose scale shall be removed with three cornered steel scrapers and hammer. No paint shall be applied until all dust, mud and grease have been carefully removed, nor shall any paint be applied during wet or foggy weather, or upon a wet surface.

First coat shall be Superior Graphite Paint No. 30 Natural applied as soon as parts are cleaned. Any parts of structure liable to hold moisture shall be cleaned and slushed with this paint.

When first coat has dried sufficiently, a period of at least 1 week being allowed to elapse, second coat shall be applied using Superior Graphite Paint No. 59 Olive Green.

All paint used shall be that manufactured by DETROIT GRAPHITE COMPANY, Detroit, Mich., and shall be delivered in unbroken packages.



BRIDGES OVER OHIO RIVER AT CINCINNATI—STRUCTURAL STEEL PROTECTED WITH SUPERIOR GRAPHITE PAINT

Anti-Aqua Dampproof Coating

Anti-Aqua is a waterproofing and dampproofing paint especially recommended for the following uses:

As a coating on the exterior of stone, brick and concrete foundations to prevent seepage of water.

As a coating on the interior of stone, brick and concrete walls to exclude dampness.

As a coating for the unexposed surfaces of marble, granite or other fine stone used in buildings to prevent seepage and straining.

As a coating between concrete walls and exterior tile or face brick of buildings.

As a plaster bond.

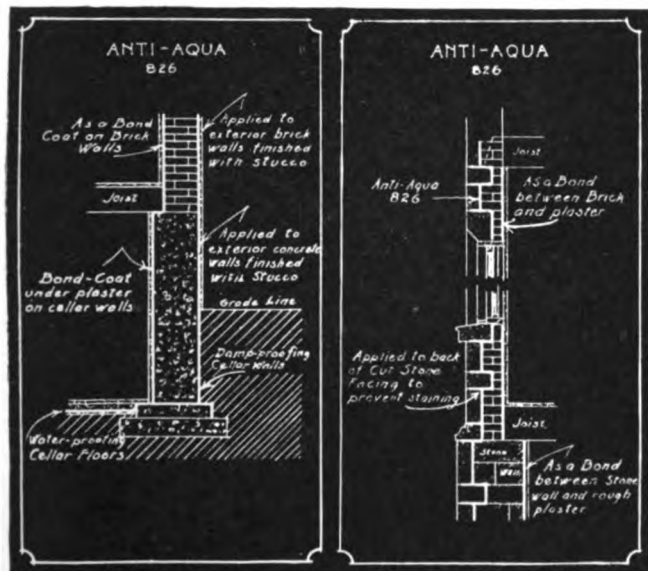
Anti-Aqua is a liquid bituminous paint of ordinary brushing consistency which dries within a few hours and when applied to stone, brick or concrete surfaces, enters into and seals up the pores, and on account of its penetration, the coating can not be destroyed by abrasion during backfilling of foundations.

Two coats of Anti-Aqua may be applied on concrete or brick walls and then followed by a coat of rough plaster. When used in this way, Anti-Aqua acts as a waterproofing paint and at the same time eliminates the use of furring and lathing.

The use of Anti-Aqua as a plaster bond on ceilings is not recommended.

The covering capacity will depend on the porosity of the surface, but under normal conditions it will be from 80 to 100 sq. ft. per gal.

Anti-Aqua is supplied in the proper consistency for application, but if for any reason thinning is necessary, only special Anti-Aqua thinner should be used. Gasoline, benzine, petroleum solvents, turpentine or its substitutes will not mix with Anti-Aqua and should not be used for thinning this paint.



DETAILS SHOWING METHOD OF APPLYING ANTI-AQUA DAMP-PROOF COATING

Sta-White

Sta-White is a pure white oil paint for industrial interiors with unusual light reflecting qualities.

It contains no lead, glue or other harmful or easily affected ingredients, bleached oil or pigments, and consequently shows no tendency to turn yellow.

Sta-White will not chip, flake or peel.

It is recommended for interior painting of mills,



factories, offices, public buildings, schools, hospitals, theaters, hotels, restaurants, etc.

Sta-White may be used on wood, metal, concrete, plaster, brick, and other surfaces. When, after a period of years, Sta-White becomes soiled, covered with dust or other settlements, the original whiteness and reflecting qualities are easily restored by brushing or washing without injury to the finish.

Sta-White will give maximum service that is expected of highest grade interior whites, both as to light reflecting qualities and durability.

Sta-White is made in high gloss enamel finish, although semigloss and flat finishes are also furnished.



WALLS, CEILINGS AND PILLARS PAINTED WITH STA-WHITE

Specifications for Application of Sta-White—General—Surfaces to be painted shall be dry and free from dust, loosely attached matter such as old paint, rust, scale, etc. All oil spots shall first receive a coat of shellac.

Concrete, Brick and Plaster—First coat shall be Sta-White Primer thinned according to porosity of surface with a mixture of equal parts of raw linseed oil and turpentine or approved turpentine substitute. Allow to dry hard before application of second coat.

Wood, Wall Board and Metal—First coat shall be Sta-White Primer thinned to a good brushing consistency with pure turpentine or turpentine substitute.

Second Coat—Second coat on all surfaces shall be Sta-White Primer thinned to a good brushing consistency with pure turpentine or approved turpentine substitute.

Third Coat—Third coat shall be Sta-White Finish (gloss, eggshell or flat) applied as received. If paint has thickened somewhat from exposure a small quantity of turpentine or approved turpentine substitute may be added. In no case shall linseed oil be used as thinner.

Two-coat Work—On account of unusual opacity of Sta-White Primer and Sta-White Finish it is possible in many cases to secure a satisfactory solid white finish with 2 coats. In such cases the second or intermediate coat as outlined above may be omitted.

Repainting—On surfaces which have been previously painted apply 2 coats only. If the old coat is white and in good condition satisfactory results can be obtained by carefully cleaning the surface and applying 1 coat of Sta-White Finish as received.

Spray Application—Sta-White Primer and Sta-White Finish may be applied by spraying as well as brushing. Because of the heavier application of paint by this method a greater length of time between coats must be allowed for drying.

Drying Time—At least 48 hours shall be allowed between coats for drying.

All paint used shall be that manufactured by DETROIT GRAPHITE COMPANY, Detroit, Mich., and shall be delivered in unbroken packages. All work shall be subject to the inspection and approval of engineer or architect.

THE HARDY PAINT & VARNISH CO.

Oakwood Avenue and Michigan Central R. R.
TOLEDO, OHIO

Products

PAINTS and PROTECTIVE COATINGS for all purposes.

Mill White (Hard-Da-Lite)

Hard-Da-Lite is a permanent, intensely white and sanitary finish for factory, store and office interiors. It is not an experiment—it has established an enviable record for long service and quantity sales.

Hard-Da-Lite reflects light to an astonishing degree; brightens up the dark spots and eliminates shadows; reduces illuminating costs; increases efficiency of workmen and insures against careless work and accidents. Will not crack or flake off and can be repeatedly washed without impairing its light reflecting qualities.

May be applied by the spray process or with a bristle brush to all kinds of surfaces—brick, stone, plaster, concrete, wood or iron.

Made in full gloss, eggshell and flat finishes.

Covers approximately 450 sq. ft. per gal. (1 coat), when brushed on smooth, clean surfaces, and 150 sq. ft. when sprayed on rough, dirty surfaces.

Interior and Exterior Oil Paints

We manufacture a complete line of lead and zinc paints ground in pure linseed oil, for general interior and exterior finishing. These reliable paints are well known for their exceptional durability and covering qualities.

A complete line of attractive colors.

Send for color card and prices.

Cement, Concrete, Brick, Stone and Stucco Paint

An artistic, flat finish paint for exterior and interior dampproofing and finishing. Does not impair the texture of the surface to which applied; gives uniform tone to entire surface; spreads easily.

Two coats are required for a workmanlike job, our Hardy-Seal being recommended for thinning the first coat.

Covers 150 to 200 sq. ft. per gal., 1 coat, depending upon the nature of the surface to be painted.

Made in 16 attractive non-fading colors, also in white.

Special colors made to order.

Hardy-Seal (Limeproof Sealer)

A limeproof water resisting liquid for sealing or priming cement, brick or plaster walls. Will prevent lime burning and water and saltpeter stains.

Can be used alone or in combination with the first

coat of our cement, concrete, brick, stone and stucco paint.

Covers approximately 400 sq. ft. per gal., 1 coat.

Acid Resisting Paint

For use on metal pipe, structural steel and iron, gutters, downspouts, etc., in places where subjected to acid fumes and gases. Will resist sulphuric, muriatic and nitric acid fumes, also chlorine and other gases.

Colors: black and dark brown.

Covers approximately 400 sq. ft. per gal., 1 coat.

Roof Paints

"Black Prince" Roof Paint (for Metal Roofs)—

A fine, elastic, black coating for any kind of roof.

Will not check, crack, peel or soften; will give lasting protection; free from injurious acids; will restore elasticity of brittle composition roofing.

Covers approximately 400 sq. ft. per gal., 1 coat, on metal; 200 sq. ft. on paper or felt.

"Black Elastic" Roof Paint (for Composition, Paper and Felt Roofs)—Has the same features as our "Black Prince" roof paint. Applied with a swab.

Covers approximately 150 sq. ft. per gal., 1 coat.

Tinners' Red—Our highest grade roof paint, made of the best grade of oxides finely ground in specially treated oil. For metal roofs, gutters, downspouts, flashings, etc. Unusually durable.

Covers approximately 500 sq. ft. per gal., 1 coat.

Roof Cements

Liquid Roof Cement (Asbestos)—Composed of asbestos fiber and the proper liquids and makes a durable, fire resisting coating that can be applied with a brush to any kind of roof. Renews elasticity of brittle composition roofings, and, owing to the asbestos that it contains, will stop pinhole leaks in metal roofs. Will last for many years.

Covers 100 to 200 sq. ft. per gal., 1 coat.

Paste Roof Cement—Composed of long fiber asbestos and plastic materials.

Applied with a trowel to any kind of roof, also around flashings and chimneys to stop leaks.

Fireproof and waterproof; will not run or become brittle; suitable for any climate or temperature; does not require heating before application; adheres tenaciously.

Has many other uses. Send for literature.

Covers 50 to 60 sq. ft. per 100 lbs. when applied in the recommended average thickness of $\frac{1}{8}$ in.

Cement Floor Paint

Preserves cement floors and prevents formation of cement dust, so injurious to health, machinery and stock. Prevents disfiguration and staining caused by oil, greases, etc.

Made in 8 standard colors. Send for color card.

Covers 300 to 600 sq. ft. per gal., 1 coat, depending on condition of floor.

Cement Floor Hardener

A clear, insoluble liquid (a paint product, not a chemical) which can be used alone or as a priming coat for our cement floor paint.

It hardens the surfaces of cement floors, prevents formation of cement dust and protects subsequent coatings from the action of alkali and lime.

Covers approximately 400 sq. ft. per gal., 1 coat.

Metal Protective Paints

"Eradirust" (Antirust Paint)—A high grade rust inhibitive coating for structural steel and other metal surfaces. Composed of black magnetic iron oxide and the highest grade paint vehicles.

For the scientific protection of structural steel, we recommend a shop coat of either our Liquid Red Lead or "Eradirust" Black or Green, a field coat of our Graphite Liquid Paint or "Eradirust" Black, and one or two finishing coats of "Eradirust."

Colors: gray, dark green, black, red and brown.

Covers approximately 600 sq. ft. per gal., 1 coat.

Liquid Graphite Paint—An old, reliable rust inhibitive coating for all metal surfaces. Composed of pure Mexican graphite and the best vehicles that modern paint technology has devised.

Covers approximately 600 sq. ft. per gal., 1 coat.

Iron Oxide Paint—Composed of the finest grade of red or brown iron oxide and high grade vehicles.

A durable rust inhibitive coating of especial value to structural steel and iron fabricators.

Also suitable for wood.

Covers approximately 600 sq. ft. per gal., 1 coat.

Liquid Red Lead—For use as a rust inhibitive priming coat on steel and iron surfaces. Covers well and flows easily. Will not harden in the container.

Covers approximately 500 sq. ft. per gal., 1 coat.

Galvanized Iron Primer—A rust inhibitive primer which will cling tenaciously to galvanized iron surfaces, whereas ordinary paints will peel off.

Covers approximately 400 sq. ft. per gal., 1 coat.

Smokestack Paints—Our line of smokestack paints is of the highest quality possible to produce. They give absolute protection from rust and their heat and weather resisting qualities and durability are unexcelled. Made in colors to suit the customer.

As we make several kinds suitable for varying conditions, send full information regarding local conditions and we will submit recommendations.

Tank Paints—We manufacture a high grade line of protective coatings for tanks of every description, whether below or above ground. They may be relied on to prevent the formation of rust and to stop leaks.

As local conditions govern the use of these paints,

give us full information and we will submit recommendations.

Waterproofing Paints and Compounds**"Foundation Black" Liquid Waterproofing—**

For interior and exterior surfaces of foundation walls. A bituminous compound that will not become brittle, nor harden or crack. Forms a tenacious and impervious coating and will positively prevent water seepage.

Covers approximately 300 sq. ft. per gal., 1 coat.

Black Paste Waterproofing—For use on surfaces of exterior foundation walls subjected to very heavy water pressure. Also suitable for waterproofing concrete floors in basements by applying on top of the concrete subfloor before the cement topping is laid.

Covers approximately 60 sq. ft. per 100 lbs.

Steel Sash Putty

Specified and used on the largest buildings. We furnished 80,000 lbs. for one of the new Overland buildings. Expands and contracts without cracking; stays in place; easy to apply.

"Pipe Identification" Enamels

Made in various standard shades for use on pipe lines in industrial plants, public buildings, hotels, etc. in order that the various lines may be readily identified, such as steam, water, gas, air, sprinkler system, ammonia, etc.

These enamels form a permanent preservative coating and are high grade products.

Send for color card and full particulars.

Machinery Finishes

Primers—Black and white oilproof, black heat resisting and black, gray and red antirust.

Dry in 18 to 24 hours.

Fillers—Dry very fast and hard, yet can be sanded readily to a smooth surface. Made in black, white, gray and maroon. Will not crack or check.

Intermediate Coatings—Absolutely oilproof. Used over fillers and protect machinery from oil and grease during testing and assembling and prevent finishing coat from sinking and spotting. Made in black, white, gray and maroon.

Finishing Paints—Dry with a beautiful eggshell finish. All colors are oilproof, and, except the white, are heat resisting. Standard colors: black, blue black, light, medium and dark steel, maroon, flat black and white. Special colors to order.

We also make a non-oilproof finish for use where oilproof finish is not required.

Slushing Compounds for Machinery

For protecting machinery during shipment or storage, we make a slushing compound—a semidrying, black coating which is easily applied with an ordinary paint brush, and easily and quickly removed with gasoline or naphtha.

Will thoroughly protect bright steel parts from rust and will not melt or drip off in warm weather, as is the case with grease or paraffin coatings.

THE SHERWIN-WILLIAMS CO.

Paints, Varnishes, Enamels, Stains, Wood Preservatives

601 Canal Road, N. W.
CLEVELAND, OHIO

CLEVELAND, OHIO

CHICAGO, ILL.

FACTORIES

NEWARK, N. J.

SAN FRANCISCO (EMERYVILLE), CAL.

SALES OFFICES AND WAREHOUSES IN PRINCIPAL CITIES

Products

Manufacturers of a complete line of PAINTS; VARNISHES; ENAMELS; STAINS; ROOF CEMENTS; WOOD PRESERVATIVES; CONCRETE and CEMENT HARDENERS; WATERPROOFING COMPOUNDS.

Facilities and Quality of Products

To meet the requirements of industrial corporations, manufacturers and all operators needing paints and varnishes, THE SHERWIN-WILLIAMS Co. has thoroughly investigated conditions surrounding each particular industry and, as a result, has developed a line of materials particularly adapted to meet each condition.

Sherwin-Williams' facilities for producing just the right product for each specific purpose are unequalled in the paint and varnish field. The sources of supply of many of the most important raw materials are controlled by THE SHERWIN-WILLIAMS Co., who operate five factories for the production of paints and varnishes—tin can factory, box factory, mines and smelters, and other essential raw material producing units.

Each product is designed for the particular use specified and will economically and effectively produce the best results.

S-W Mine, Mill and Factory Colors

Sherwin-Williams Mine, Mill and Factory Colors are recommended for decorating and preserving exterior surfaces where a durable oil paint is required at moderate cost.

Used largely where operators desire to maintain standard uniform colors at various plants, employees' houses, etc. (See plant standardization plan on next page.)

S-W Metalastic (Liquid)

Metalastic is a combination of carbon black, graphite and specially treated pure linseed oil, producing a film that is very elastic and durable. The drying is so regulated by special dryers that it is an ideal paint for shop coats on structural steel. It is also recommended as a fabricating coat. Furnished in four colors—black, brown, green and dark gray—ready for use.

Put up in 1-qt., 1-gal. and 5-gal. cans, also barrels.

S-W Non-corrodible, Acid Resisting Paint

A splendid antirust paint with graphite for its pigment base. It will be found very durable and economical for metal surfaces. It is a scientifically prepared coating for use on metal surfaces subjected to the action of gases, acids or their fumes, salt water, ammonia, and other disintegrating agents. Especially adapted for use



on smelters or buildings adjacent, which are subjected to sulphuric acid fumes and similarly exposed locations.

Put up in 1-gal. pails, 5-gal. square tin cans and barrels.

S-W Galvanized Iron Primer

Prepared ready for use. This is a paint for priming or first coating galvanized iron and sheet metal surfaces; metal sash and trim, cornices, leaders and in fact any galvanized iron surface. (It is a perfect undercoating and can be successfully applied to galvanized iron and sheet metal surfaces.) It is made especially for high class work and subsequent coats of S-W Metal Protective and Oil Paints must be applied not longer than 4 days later. Made in gray only.

Put up in 1-qt., 1-gal. round cans, 5-gal. square cans and barrels.

S-W Roof and Bridge Paint

An economical paint for roofs, bridges, barns, fences, etc., of metal or rough lumber.

S-W Carbon Paint, Red Diamond Brand

Absolutely the best chemically inert carbon metal protective paint possible to manufacture. Produces a homogeneous film which insures maximum protection.

S-W Salamander Smokestack Black

Especially made for boilers, smokestacks and surfaces subjected to great heat. Elastic and very durable.

S-W Gas Engine Enamels

Especially adapted for finishing machinery, engines and all metal work, etc., where a rich gloss elastic finish is desired. Does not become brittle nor mar easily.

S-W Graphite Pipe Joint and Gasket Compound

A practical advantageous material indicated by its name. It makes a perfectly tight joint with less labor and cost than red lead and other materials and, in addition, allows the various fittings on which it has been used to be uncoupled without the loss or breakage characteristic of red lead, cement or rust-set joints. Does not become hard in the package.

S-W Lustral Enamels

Designed particularly for use on wood and metal surfaces, where an elastic high gloss enamel finish is desired. Constructed to withstand severe usage to a maximum degree. Made in a number of attractive shades.

S-W Egg-shell Mill White

Egg-shell Mill White is an intensely white paint for coating interior surfaces of mills and large manufacturing plants.

It dries with a perfect eggshell or semimatt finish, producing the greatest amount of light distribution or diffusion possible to secure from a white paint, eliminating to a certain extent the reflective glare found in many plants where high gloss finish is used.

It is put up in 1- and 5-gal. containers; also in barrels.

S-W Ajax Insulating Varnishes and Compounds

In Ajax insulating materials THE SHERWIN-WILLIAMS Co. offers a complete line of insulating varnishes, both air drying and baking compounds, acid resisting paints, spirit varnishes, etc. The same care that is used in the manufacture of the entire line of Sherwin-Williams paint and varnishes is used in the production of insulating materials. The raw materials are selected with the greatest of care by experts in this line and are combined in a way that only long experience, careful research and a full knowledge of the business can teach.

Every batch is carefully tested (before shipment is made) in THE SHERWIN-WILLIAMS Co.'s well equipped laboratories for heat resistance, oilproof and moisture-proof qualities, as well as dielectric strength.

This painstaking care, that is used both in the manufacturing as well as the testing of S-W insulating materials, assures a product that at all times will meet the exacting requirements of users of electrical equipment of all kinds.

S-W Preservative Shingle Stain

An exceptional line of shingle stains made on a creosote basis for use on shingle roofs and all shingle parts. It is also well adapted for stables and outbuildings, as it is an excellent wood preservative, as well as a strong disinfectant.

S-W Ebonol

An economical black elastic paint for use on paper, composition, felt and canvas roofing and on exterior equipment of any sort where an economical paint is desired. Can be used on tin roofing, as it absolutely contains no acids harmful to the metal. It is also adapted for use on rain-water tanks, standard pipe, sluice boxes, water troughs, gutters, copings, fences, etc.

Ebonol has excellent covering capacity, works well under the brush and will stand outdoor exposure.

S-W Ebolastic Roof Cement

Without doubt the most durable and economical roof cement on the market today. For use in repairing all leaky roofs; can either be used for patching or can be spread over the entire roof, making practically a new roof at a very small cost. Cracks and holes in brick, stone, concrete, chimneys and other exposed surfaces can be sealed up with comparatively little trouble by using this material. It is made on a pine tar basis with long asbestos fiber as its pigment, which makes it fireproof.

S-W Ebolastic Roof Cement will remain plastic in all temperatures, will not run in the hot summer sun or crack in freezing temperatures.

Put up ready for use in 1-, 5-, 25- and 100-lb. containers and barrels.

From 25 to 50 lbs. will be required for 100 sq. ft. of roofing.

S-W Carbolic-Oil (A Wood Preservative)

Carbolic-Oil is a pure anthracene oil derived from the distillation of pure coal tar, or in other words, the heaviest oil produced from the distillation of coal tar and what is known as a high boiling point oil. The distinction between an anthracene and creosote oil is that the latter distills at a low temperature, consequently is lighter in gravity, more volatile, and generally recognized as not being efficient for the types of work for which Carbolic-Oil is recommended.

Particularly recommended for use on poles, shaft timbers, trestles, flumes, tipples, air shafts, sheds, etc.

Carbolic-Oil can be sprayed, dipped or brushed and where possible, dipping is preferable, heating the material about 200° Fahr. It is always preferable to heat a wood preservative before applying, as this greatly assists the impregnation of the wood.

S-W Concrete and Cement Hardener




An effective preparation for hardening and waterproofing cement. The value of using a preparation for hardening and waterproofing cement can not be overestimated. Cement, the same as all other materials, is subject to wear and decay from the elements unless properly protected. By filling up the open pores or voids with S-W concrete and cement hardener, the cement may be greatly strengthened or hardened, thus giving it much better wearing properties. The elements have no effect on S-W Concrete and Cement Hardener, as, after the pores of the cement are filled with this material, the cement becomes permanently and thoroughly waterproof.

S-W Antydamp Foundation Dampproofing

An excellent dampproof, alkaliproof, and acidproof black composition, used for hermetically sealing concrete and stone foundations against the detrimental agents mentioned.

S-W Plant Standardization Plan

THE SHERWIN-WILLIAMS Co. has a plant standardization plan of special interest to mine operators (see sample below). Complete information of this plan, together with a system worked out for general use, will be submitted on request.

STANDARDIZATION CHART				
OF PAINTS AND VARNISHES				
LEHIGH & WILKES-BARRE COAL COMPANY				
WILKES-BARRE, PA.				
NUMBER	COLOR	USE	HOW USED	PER GALLON COVERING CAPACITY
33 Sherwin-Williams Black No. 33		Boiler and Heating Engines, Fan Engines, Compressors and Pumps, (Interior Only)	One coat over filler	600-650 sq. ft. per coat
34 Sherwin-Williams Black No. 34		Pipe, Drift, Engines, Conveyor Fan Bearings, Chain Hoist and Shop Engines, Hot Water Heaters, Shop Heating Engines, Tanks, Pumps, Engines and Boilers	One coat over filler	600-650 sq. ft. per coat
35 Intermediate Coat No. 35		When clipped down to filler	One or more coats as needed	600-650 sq. ft.

STANDARDIZATION CHART

Special Paints

It is of course impossible to describe the entire line of Sherwin-Williams products in these columns—only a small percentage being mentioned here. However, this company makes a special paint for every surface and is prepared to furnish at once and in any quantity just the right product for any purpose. THE SHERWIN-WILLIAMS Co. will be glad to solve specifically any paint problem.

THE TROPICAL PAINT & OIL CO.

Manufacturers of Technical, Structural, and Dampproofing Paints of
Scientific Reliability

GENERAL OFFICES AND FACTORIES
CLEVELAND, OHIO

Special Products

ENGLISH STRUCTURAL STEEL PAINT.
ELASTIKOTE—Exterior Protective Paint.
TOCO GRAPHITE—Superior Quality.
CEMENTKOTE—A Waterproofing Paint
for buildings of brick, cement, etc.
FLOORKOTE—Cement Floor Paint.
TROPICAL WATERPROOFING PAINT—
Foundation Waterproofing.
TROPOLITE—High Heat Resisting Black.
REXOKOTE—A Waterproof Roof Black.
TOCOSEAL—Plastic Roofing Cement.
TROPICAL FINEST OUTSIDE GLOSS WHITE PAINT.
TOCO MILL WHITE—In Dull and Gloss.
TOCOTONE—Interior Flat Wall Finish.
B. and P. ENAMEL—Interior Finish for hard
service.
BOILER SEAL—A Heatproof Insulation for boiler
settings.
ARCHITECTURAL VARNISHES—Of the Highest
Grade.



many users have against the ordinary prepared paint; and in working out the Elastikote problem it was discovered that, in the practical application of Elastikote, certain new and unusual protective features were developed.

In its wide adaptability, Elastikote, applied to wood, metal, iron or steel, brick, stone, cement, etc., is probably the only paint that possesses the necessary elasticity, toughness, adhesive qualities and extreme weather resisting qualities necessary to conform to the various conditions met with in treating the several surfaces mentioned, and from which dependable results can be obtained.

In the manufacture of Elastikote a certain percentage of a specially prepared natural elastic gum is incorporated by a process of our own. This gum, scientifically fused and blended with the usual paint pigments finely ground, and the resulting combination thoroughly mixed with pure linseed oil and dryers, forms the basis of Elastikote to which only the purest and most durable tinting colors are added.

Although Elastikote is made in light colors, such as white, buff, fawn, etc., its greatest elasticity is obtained in the darker positive colors, such as the greens, reds, browns, maroon colors, etc., for the reason that these darker shades carry the gum base, which so greatly adds to the flexibility and durability of Elastikote.

Elastikote comes ready to apply. It is a full, heavy bodied paint, stays well in suspension and will thoroughly cover more surface than any prepared or hand mixed paint. Two coats are recommended.

English Structural Steel Paint

There are certain classes of work requiring the highest grade of ferric oxide paint. English Structural Paint is made specifically for exposed metal surfaces, such as iron and steel construction work, bridges, railway and street railway maintenance; gas, electric and water plants; towers, tanks; telegraph, telephone and trolley poles.

The protection of metal against rust, corrosion, and electrolysis is a waterproofing problem and its solution can only be accomplished by the use of a continuous, impervious insulation that will protect it from contact with moisture. Corrosion can not exist without oxygen, which is supplied by water. Rust is steel or iron chemically changed by the presence of moisture.

To properly protect exposed metallic surfaces requires a paint film which is, first, impervious; second, elastic; and third, one having a pigment base that is inert, finely ground, and at the same time powerfully adhesive. English Structural Paint is the result of years of practical tests. The combination of pigments and vehicles used in its make-up has proved to be of very great durability.

English Structural Paint is made in the usual standard colors: maroon, English oxide red, green, brown, lead color, and black; is full bodied, and ready for the brush. Two coats are recommended.

Elastikote

A high standard protective and preservative paint made in strong positive colors, black and white, designed for general use on all exterior surfaces exposed to severe weather-wear, requiring solid, substantial, durable paint protection.

Elastikote is the result of thirty years' experience and scientific research to overcome certain prejudices

Toco Graphite

A full bodied graphite paint of the greatest durability and wear resisting qualities. It will follow the expansion and contraction of metal perfectly without scaling or cracking and is particularly adapted for coating structural steel to be incased in concrete. In this dampproofing and alkali resisting feature, Toco Graphite is superior to other graphites, which renders it especially desirable for bridge and railroad work.

Toco Graphite dries with a tough, glossy, dark steel gray finish and will stand up under the most severe test.

While ordinary metallic paints are not claimed to cover more than 300 to 400 sq. ft. under favorable conditions, Toco Graphite will cover from 600 to 700 and as high as 1000 sq. ft. to the gallon. Two coats are recommended.

Cement Coatings

Long experience in dealing with the problem of waterproofing and painting cement and concrete surfaces qualifies us to place at our customers' disposal the following products of proved reliability:

Cementkote, for cement, brick, stone or concrete walls above ground; *Floorkote*, for concrete and cement floors.

All concrete or cement work is permeated with a fine network or system of capillaries, which absorb and distribute moisture to all its parts. These ducts or capillaries can not be filled during the curative stage of the concrete without materially interfering with the chemical action of the cement, as these conduits are necessary to introduce the moisture so essential during the curative stages.

Nothing therefore should be used in mixing mortar that will fill these capillaries, but they should be left open until the chemical action of the cement has taken place, thoroughly set and hardened, also dried out and seasoned for several months. The surface is then ready to paint. Walls should be painted and dampproofed with 2 coats of Cementkote applied according to directions.

Cementkote—A preservative and decorative paint for exterior dampproofing of cement, brick or stone walls above ground. Cementkote dries with a flat finish. Covering capacity 150 to 200 sq. ft. to the gallon, 2 coats.

Floorkote—A durable, wear resisting coating for cement floors. Dries with a full gloss.

Cement floors should be painted with Floorkote, which not only fills and finishes the surface in a beautiful glossy tilelike effect, but also prevents staining, grinding and dusting that is sure to follow the use of unpainted concrete floors.

Covering capacity 200 to 250 sq. ft. to the gallon, 2 coats.

Floorkote is superior to ordinary floor paint for wood floors as well.

Tropical Waterproofing Paint

All concrete, cement, brick and porous stone foundation walls should be thoroughly waterproofed on the exterior side before filling in the earth between the foundation and the unexcavated ground. Tropical Waterproofing Paint has proved itself to be a foundation proofing of the highest order. It is a tenacious black which is easily and readily applied, covering about 65 sq. ft. to the gallon, 2 coats.

Tropical Waterproofing Paint produces a continuous film which has sufficient elasticity to remain intact regardless of the expansion and contraction of the surface to which it is applied.

Tropical Waterproofing Paint prevents water seeping through the walls of concrete cisterns, swimming pools, elevators, elevator pits, water troughs, etc.

Tropical Waterproofing Paint prevents metal lath from rusting and should be used on all artificial stone and concrete work, marble, etc. to prevent mortar stains.

Tropolite

In Tropolite this company has developed the greatest heat resisting paint known. It dries with a black, glossy enamel finish and is unaffected by heat that will break down the best graphites, boiler and front end paints on the market. Tropolite will stand from 700° to 800°, which is 200° higher than any other known paint coating will stand. Two coats are recommended.

Rexokote

A black roof and metal paint that is tough and elastic. For general use. Dries with a brilliant black gloss finish. Two coats are recommended.

Tocoseal

An asbestos fiber plastic roofing cement. This product is manufactured from genuine asbestos fiber, combined with mineral gum. It comes in the form of a soft, pliable paste and is applied to new or old roofs with an ordinary oblong shaped smoothing trowel or a long

handled spreading tool. It sets up in two or three days and gradually hardens into a rough rubbery coating that is waterproof, fire resistant and extremely durable. Tocoseal puts a new roof on a building without removing the old one, at a moderate cost, and will last longer than several coats of the most expensive paint.

Consult us on any roofing problem.

Tropical Finest Outside Gloss White

Made originally for private use only. This product is the last word in exterior white paint. It is of unusual whiteness, magnificent body, and will outwear and outlast any other white paint made. Two coats are recommended.

Toco Mill White

A high grade, durable, solid body white paint for factories, textile mills, warerooms, where lighting and cleanliness are essential features. Made in both gloss and dull finish. Toco Mill White is durable and washable; will not scale or check off and holds its color to a remarkable degree.

Tocotone

A durable, non-absorbent, washable interior flat paint. Tocotone can be used upon all plaster surfaces—rough, smooth, sand finished or pebbled; also upon composition wall board, metal ceilings, wood trim, upon burlap and other cloth wall coverings and, in fact, it is suitable for any interior wall surfaces. Two coats are recommended.

B. and P. Enamel

For plaster, cement, wood or metal. This special line of interior enamels has been produced to fit the peculiar and exacting requirements of breweries, packing houses and bakeries, where the interior finish of these buildings must withstand condensation of steam, fumes and odors, or for condensers, ammonia pipes, hop jackets, boiling or storage tanks and where the interiors must be kept scrupulously clean for washing.

This enamel does not absorb moisture, because when applied it produces a porcelainlike, hard and durable film. Sulphate or carbonate of lead is not used in this product. Many government laws and regulations restrict the use of lead in paints used where food products are manufactured or handled.

B. and P. Enamel is sanitary, decorative, and free from detrimental volatile odors. It is dampproof, therefore no mildew, mold, dry rot, decay or dampness can exist, preventing the breeding or growth of fungi or germs.

Recommended for the protection and decoration of walls and ceilings in killing rooms, butter and sausage rooms, refrigerators, coolers, engine rooms, the outside of aging tanks, offices and showrooms.

Covering capacity on concrete or plaster 200 to 250 sq. ft. to the gallon, 2 coats.

Tropical Boiler Seal

A plastic insulating cement for boiler settings. It eliminates the suction of cold air through the cracks, crevices and pores of the brick, thus preventing cooling of the boiler shell and furnace gases. An accurate, unprejudiced test shows an increase of CO₂ from 9% to 11½% by its use.

Architectural Varnishes

In addition, this company manufactures a line of highest grade architectural varnishes to meet every possible requirement.

U. S. GUTTA PERCHA PAINT COMPANY

FACTORY AND MAIN OFFICES

PROVIDENCE, R. I.

DISTRIBUTORS IN ALL PRINCIPAL CITIES

Products

Manufacturers of RICE'S PAINT SPECIALTIES: "BARRELED SUNLIGHT," THE RICE PROCESS WHITE—Gloss, Eggshell or Flat; RICE'S UNDERCOAT; GRANOLITH CONCRETE COATING; CHEMIC ENAMEL; RICE'S REINFORCED OUTSIDE PAINT; RICE'S PIPING ENAMELS; FLAT WALL PAINT; FLOW-ON.

Also manufacturers of other Paints and Enamels for interior and exterior finish, structural and metal protection; Fillers and Paints for machinery of all kinds; Technical Paints for all purposes.

"Barreled Sunlight"—The Rice Process White

The original "mill white" with a smooth, lustrous finish that is keeping interiors bright and clean in thousands of industrial plants, institutions, power plants, etc. The standard wherever a light reflecting and sanitary finish is desired.

Made by the Rice Process which combines ease of application, intense whiteness, and unequalled hiding properties by use of oil only. No varnish required. (All imitations are varnish paints.)

Guaranteed to hold color longer than any other gloss white paint. Because of free flowing by brush or spray, it costs less for labor in applying, so that applied cost is actually lower than for other "mill whites," which are sold at a lower price per gallon.

Tested and approved by the National Board of Fire Underwriters, Inc.—their report, "Retardant No. 926."

Though "Barreled Sunlight" is made in eggshell and flat we recommend gloss for industrial uses, as flat and eggshell finishes do not resist dust and dirt as well as the gloss, nor can they be as readily cleaned.

Rice's Undercoat

Used for priming under "Barreled Sunlight." Made to offset the adverse conditions which the paint is called upon to meet when lumber is sappy and unseasoned.

See specifications on this page.

Rice's Granolith for Ceilings and Walls

A concrete, cement, plaster and brick coating. Retards dampness. Sometimes a single coat only is applied. Its larger use is as an undercoat on concrete, cement, brick and plaster for finishing coat or coats of "Barreled Sunlight."

See specifications on this page.

"Barreled Sunlight" Specifications for Use in Industrial Plants

Woodwork and Wall Board—Allow as much time as practicable for wood to season. Clean the surfaces from mildew or anything else detrimental to paint.

First Coat—"Barreled Sunlight" Undercoat. This may be reduced to a proper brushing or spraying consistency with turpentine (or approved turpentine substitute).

Second Coat—If knots or sappy spots show through priming coat, shellac these well and apply second coat of "Barreled Sunlight" Undercoat. Reduce if necessary as above.



Third Coat—"Barreled Sunlight," the Rice Process White (Gloss, Eggshell or Flat).

Concrete, Brick and Cement Plaster—Scrape excess mortar from all surfaces. When thoroughly dry, neutralize lime and free alkali by applying a solution of zinc sulphate dissolved in water (4 lbs. of zinc sulphate crystals to the gallon of water); allow 36 hours for drying and proceed as follows:

First Coat—"Barreled Sunlight" Granolith. This coat should be reduced with a mixture of equal parts of linseed oil and turpentine (or approved turpentine substitute), according to the porosity of the surface.

Second Coat—"Barreled Sunlight" Granolith. This may be reduced to a proper brushing or spraying consistency with turpentine (or approved turpentine substitute).

Third Coat—"Barreled Sunlight," the Rice Process White (Gloss, Eggshell or Flat).

Hard Finished Plaster and Gypsum Work—Neutralize lime and free alkali by applying a solution of zinc sulphate dissolved in water (4 lbs. of zinc sulphate crystals to the gallon of water); allow 36 hours for drying and proceed as follows:

First Coat—"Barreled Sunlight" Granolith. Reduce with equal parts of a mixture of 3 parts linseed oil and 1 part turpentine (or approved turpentine substitute), to which has been added sufficient drier to set the coat thoroughly hard.

Second Coat—"Barreled Sunlight" Granolith. This may be reduced to a proper brushing or spraying consistency with turpentine (or approved turpentine substitute).

Third Coat—"Barreled Sunlight," the Rice Process White (Gloss, Eggshell or Flat).

Iron, Steel and Metal Work—Remove all mill scale, rust or grease by scraping. Apply a coat of pure red lead paint.

First Coat—"Barreled Sunlight" Undercoat. This may be reduced to a proper brushing or spraying consistency with turpentine (or approved turpentine substitute).

Second Coat—"Barreled Sunlight" Undercoat. Reduce if necessary as above.

Third Coat—"Barreled Sunlight," the Rice Process White (Gloss, Eggshell or Flat).

Repainting—On a surface previously painted with an oil paint which is in good condition, a single coat of "Barreled Sunlight" is often sufficient. If two coats are required, use Undercoat as the primer.

Over Old Cold Water Paint or Whitewash—Scrape all loose scale and dirt from surface, using wire brushes. Brush off with brooms. Apply "Barreled Sunlight" Undercoat liberally thinned with linseed oil. About 1 qt. of oil to 1 gal. of paint for painting over two or three coats of cold water paint; equal parts linseed oil and paint when painting over three or more coats. Allow 3 or 4 days for drying, then apply finishing coat of "Barreled Sunlight" as received.

Two-coat Work—By reason of the intense opacity of "Barreled Sunlight," the Rice Process White, and where economy is desired, it will be found possible to obtain a solid white finish with two-coat work. On new woodwork, use "Barreled Sunlight" Undercoat for the first coat. On new brick, concrete and plaster, use "Barreled Sunlight" Granolith for the first coat.

Rice's Chemic Enamel

For laboratories, bakeries, dye and bleach houses and other places where chemical fumes, excessive heat, steam or other discoloring agents may be prevalent. It has all the physical qualities of "Barreled Sunlight" in its intense whiteness and smooth, lustrous finish. Is reinforced, though, to give white paint protection where ordinary white paints and enamels can not stand up against the action of such adverse conditions.

Rice's Chemic Enamel Specifications

The unusual conditions under which Rice's Chemic Enamel is practically always applied, make it necessary for us to submit different specifications covering the application of this paint and its priming coat in most every case. Let us send a set of Chemic Enamel Specifications covering its application under your own particular conditions.

Rice's Flow-On, a Practical Flat Wall Paint in Semipaste Form

Rice's Flow-On is made in semipaste form, weighing 20 lbs. to the gallon. This is so that the master painter may use his discretion in adapting it to his various needs.

Rice's Flow-On combines simplicity with quality. It is practically the lithopone counterpart of "lead and oil," combining the advantages of the latter with the greater capacity or hiding power of lithopone, and the flowing quality which our special process gives the oil.

Flow-On contains no varnish or China wood oil. It is non-poisonous and washable. It flows freely and evenly, leaving a smooth finish in which there are no brush marks or laps.

Rice's Flow-On Specifications for Interior Ceiling and Wall Painting

Plaster Surfaces—First Coat—Mix a priming paint of Rice's Flow-On (proportion 1 gal. of paint to 2 gals. pure linseed oil) with sufficient dryer to set the coat thoroughly hard.

Second Coat—Rice's Flow-On. Reduce with equal parts linseed oil and turpentine. About $\frac{1}{3}$ gal. of this mixture to 1 gal. Flow-On.

Third Coat—Rice's Flow-On. Reduce with about 1 qt. turpentine to 1 gal. Flow-On.

Wood and Similar Surfaces—First Coat—Rice's Flow-On. Reduce with equal parts linseed oil and turpentine. About 1 gal. of this mixture to 1 gal. Flow-On.

Second Coat—Rice's Flow-On. Reduce with equal parts linseed oil and turpentine. About $\frac{1}{3}$ gal. of this mixture to 1 gal. Flow-On.

Third Coat—Rice's Flow-On. Reduce with about 1 qt. turpentine to 1 gal. Flow-On.

Brick and Concrete Surfaces—First Coat—Rice's Granolith. Reduce with equal parts linseed oil and turpentine according to porosity of the surface.

Second Coat—Rice's Flow-On. Reduce with equal parts linseed oil and turpentine. About $\frac{1}{3}$ gal. of this mixture to 1 gal. Flow-On.

Third Coat—Rice's Flow-On. Reduce with about 1 qt. turpentine to 1 gal. Flow-On.

Rice's Reinforced Paint, Exterior

A scientifically machine-made paint designed in the interest of consumers. Contains the proper percentage of lead, enough zinc to prevent chalking, enough additional reinforcing pigment to insure the most resistant coating and pure linseed oil treated by a process that removes all objectionable constituents. These components are thoroughly and intimately blended by special machinery, insuring absolute uniformity.

Send for color card giving complete details.

Rice's Equipment Service Paints

A group of special service paints for use in industrial plants comprising Rice's Piping Enamels, Granolith for cement floors, Dado paints and others.

Rice's piping enamels are of particular interest in view of the now widely practiced "color methods" of identifying piping equipment. Supplied in distinctive colors, these enamels make possible the systematizing of the entire piping equipment of a building or plant, so that each class of piping may be instantly identified.

Send for our booklet, "Rice's Paint Products for Industrial Plants," which describes Rice's Equipment Service Paints.

Rice's Machine Paints and Fillers

The final finish of a machine is a very important matter to the manufacturer. That surface must be obtained which will most help the sale of the machine and at the same time protect and adapt it for its intended use.

A wide experience in the "building up" and obtaining of the proper finish for all kinds and classes of machinery for many of the world's largest makers, places us in a position to be of considerable service to those who have problems of this kind to solve.

Write for samples and specifications covering the finish for that particular machine or piece of machinery you are interested in.

In General

For best results with any paint, time should be allowed for plaster, concrete, cement and unseasoned lumber to become dry.

It is important that each coat be allowed time to dry thoroughly before succeeding coats are applied.

At all times have room where paint is being applied well ventilated in order to prevent condensation, and apply the paint, especially the finishing coat, when weather is free from moisture.

All paint to be delivered on the job in the original packages bearing the name of the manufacturers, U. S. GUTTA PERCHA PAINT COMPANY, Providence, R. I.

Packages

All paints and enamels are shipped in churn-equipped barrels. By simply turning the crank the contents are kept thoroughly agitated and uniform results are assured.

Specification Forms

Architects and engineers will be furnished with specification forms and full descriptive matter on application if they will mention the finish in which they are interested.

The specifications will name the proper primers and give recommendations for the proper "building up" of a surface preparatory to receiving paints or enamels.

WAILES DOVE—HERMISTON CORPORATION

FORMERLY AMERICAN BITUMASTIC ENAMELS COMPANY

Manufacturers of Protective Paints and Coatings

17 Battery Place
NEW YORK, N. Y.

BRANCH OFFICES

PHILADELPHIA, PA., 322 South Delaware Avenue

CLEVELAND, OHIO, Rockefeller Building

WORKS, GARWOOD, N. J.

Products

BITUMASTIC and HERMASTIC SOLUTIONS, ENAMELS and PAINT—Protective Coatings for iron, steel and concrete exposed to atmospheric moisture, electrolysis, acids, acid fumes, sewage, brine, gases, alkalis, etc., buried in the ground or submerged in fresh, salt, or mine water.

General Description of Bitumastic and Hermastic Compositions

These compositions are of a bituminous base, so treated in manufacture as to eliminate all useless and harmful substances. Being free from those ingredients which limit the life and usefulness of ordinary coal-tar and asphaltum compounds, they possess exceptional physical properties—i. e., toughness, tenacity and pliability. These properties they retain throughout a far broader range of temperature and under more severe mechanical distortion and abrasion than have generally been considered to be within the scope of a bituminous composition.

Bitumastic Solution

A heavy, black, bituminous paint of superior preservative properties and mechanical strength. It dries quickly, forming a tough, elastic coating.

Under conditions of moderate severity where ordinary paints last but a short time, the Solution gives exceptional protection for long periods.

Adaptability—Bitumastic Solution is used against

Acid fumes	Gases
Sewage	Alkalis
Brine	Moisture
Water	Electrolysis

IN INDUSTRIAL PLANTS TO PAINT

Structural steel	Brine systems
Boiler fronts	Tanks
Smokestacks	Pipe lines
Coal bunkers	Sheet iron and steel

and for other similar purposes.

In the engineering and construction field its applications will suggest themselves to the engineer.

Method of Application—The surfaces to be coated must be thoroughly clean and free from rust, scale, paint, oil and moisture. Bitumastic and Hermastic Coatings should not be applied to wet, frosty or greasy surfaces.

On metal, 2 coats are customary; the second following the first after an interval of 12 to 24 hours. On wood, 3 coats are recommended.

Covering Capacity—Properly applied, the covering capacity is as follows: On steel, 1 coat, 1 gal. to 200 to 250 sq. ft.; 2 coats, 150 sq. ft. On cast iron, covering capacity is a trifle less; on concrete surfaces, approximately 100 sq. ft. to the gallon. It is suitable for use on any surface to which paint may be applied.

Containers—Put up in 1-gal., 2-gal., and 5-gal. cans and in 50-gal. barrels.

Hermastic Enamel

A durable, protective coating to be used under the most severe corrosive conditions where lasting protection and ultimate economy are of the first importance. It is applied hot over a coat of priming solution, to such thickness as may be desired (usually $\frac{1}{8}$ in.), and forms a black coating which hardens immediately, ready for service.

This coating is exceptionally ductile, strongly adhesive and impervious to moisture, chemical fumes, sulphurous gases, salt water, salt atmosphere, most acids and other corrosive agents. As its insulating capacity is high it is an effective protection against electrolysis. The resistance of this coating to mechanical injury from distortion and abrasion under service conditions is exceptional, and marks a distinct and noteworthy advance in the art.

Adaptability—Hermastic Enamel is particularly recommended for the following:

Internal and external surfaces of steel pipe lines, and other parts of drainage systems
Tanks of every description; coal bunkers
Ventilating fans and blowers which must handle moist air and acid fumes
Conveyors, penstocks, trash racks and other steel items of hydraulic plant
Cooling towers; bridges
Steel structures exposed to salt air and spray or other especially corrosive conditions
Sheet steel buildings; chemical installations; sheet steel piling

And many other uses too numerous to be listed here but familiar to every engineer, architect and industrial executive.

The coating is sanitary, tasteless and colorless and may safely be used as a lining for tanks to contain drinking water.

Application—Hermastic Enamel may be applied in the field or at the point of fabrication, as may be preferable and consistent with best results, either by dipping, brushing or pouring, as may be required by the specific exigencies of the work in hand. When the dipping process is used the priming coat may be dispensed with, provided the surfaces to be coated can be heated before dipping to a temperature of 350° to 400° Fahr. This is the prevailing practice when steel pipe lines are coated at a shop where dipping tank and a heating furnace are available.

The enamel is shipped in solid form in drums, barrels or blocks. It is heated to between 350° and 400° Fahr. and applied while in a molten state, after the primer has dried to a tacky consistency. It sets immediately, and when applied about $\frac{1}{8}$ in. thick covers approximately 2 sq. ft. per pound.

Full instructions for application will be supplied on request. Whenever necessary, the manufacturers are prepared to supply expert instruction and supervision over the application of these coatings, or, under special conditions where the best interest of the purchaser will

be served thereby, to do the work on a contract basis with their own workmen.

Ultimate Economy of Hermastic Enamel—The chief item in the maintenance cost of steel structures is the cleaning and preparation of the surfaces for repainting. After the application of Hermastic Enamel this expense is saved, for the coating will outlast many coats of the ordinary protective paints.

It is this saving of the cost of continual repainting that makes Hermastic Enamel the protective coating of ultimate economy.

Bitumastic Paints in Colors

Bitumastic paints comprise a line of liquid preservative paints of the same standard that has been associated with the name Bitumastic for nearly seventy years.

Engineers, shipbuilders, shipowners, industrial executives, in short, all who must contend with the destructive corrosion of steel and other structural materials will find in these paints the answer to their demand for a protective paint that should have the preservative qualities and the durability of the bitumens, but should get away from the uniform *black color* that has hitherto limited the usefulness of ordinary bituminous paints and compositions.

As with all Bitumastic products, these paints are in no sense by-products or side-lines. Quite to the contrary, they have been made possible by the application of new principles and methods which are the outgrowth of more than a half-century of experience in the manufacture and use of bituminous paints and compositions. For years our laboratories have been working to produce a *colored* bituminous paint that would be so entirely satisfactory from the standpoints of service, appearance, and cost as to justify our marketing it under the Bitumastic name. This purpose we feel has now been accomplished.

Despite their excellence, these paints compare so favorably in price with other paints used in the same service that they will command the confidence of the experienced buyer and user of protective paints, who knows what should be expected of them, and who is competent to size up the true relation between first cost and ultimate economy.

Permanency of Color—Bitumastic paints are not colored with vegetable dyes, but contain only reliable and enduring ingredients. Once they have dried, there is no further chemical action in the film tending toward its deterioration and eventual breakdown. They will not soften, crack or run under any extremes of atmospheric temperature, and will retain their depth of color and shade equal to the best grade of oil paints. The pigments are kept in suspension by special processes, assuring an exceptionally small amount of settlement which is easily overcome by stirring when about to use the paints.

Covering Capacity—Bitumastic paints brush out easily, and on ordinary structural steel cover at the rate of about 350 sq. ft. per gallon in 2 coats, which is the

ordinary practice in protecting structural steel. They dry quickly, forming a tough elastic film of full body and attractive surface with just sufficient gloss.

The covering capacity here given is based upon the requirements of effective service under normal conditions, and it will be understood that it is quite possible to brush the paints out over a far greater area if it is desired to sacrifice thickness of protective film.

Adaptability—Bitumastic paints are recommended

IN GENERAL CONSTRUCTION FOR

Concrete floors in buildings, schools and cellars of private residences, where it is desired to prevent surface dusting of the concrete and where the surfaces are subject to considerable abrasion and constant walking
Steel framing and sheet steel siding for industrial buildings
Metal roofs, gutters and eave-spouts
Iron fences, fire escapes and ornamental iron work
Window sash, ventilators and skylights
Wrought iron pipe and fittings

ON RAILROADS FOR

Cars, underframes and trucks
Signal bridges and transmission towers
Steel car-floats and other floating equipment
Bridges, buildings and other structures

ON MACHINERY FOR

Farm machinery
Industrial equipment
Construction plants

In general, for all structures that must be protected against fresh or salt water, cement alkalis, or corrosive vapors and fumes.

These paints are not affected by the action of lime or setting cement, and may be used on steel that is to be built into cement or concrete without fear of their destruction and the resulting corrosion of the steel.

The use of different colors for successive coats will overcome the inspection difficulties that have hitherto worked against the use of black bituminous paints for this service despite their manifold and well-known merits.

Bitumastic paints have high dielectric properties and are proof against the action of SO_2 and other corrosive fumes. They possess antiparasitical properties and when used on wood act not only as a protective film but also as a preservative stain.

Containers—They are put up in 1-gal. and 5-gal. cans, and in 50-gal. barrels.

Method of Application—The surfaces to be coated must be thoroughly cleaned and free from rust, scale, oil and moisture. On metal 2 coats are customary. As Bitumastic paints are subject to a slight volatilization when exposed to the air, the containers should be kept closed except while paints are being taken from them.

Specifications

The form of specification for Bitumastic and Hermastic products is dependent upon the nature of the work and the exposure to which surfaces are subjected. A thoroughly protective specification to meet any given condition will be furnished on application.

THE BARRETT COMPANY

Wood Preservative

NEW YORK
CINCINNATI
MINNEAPOLIS
ATLANTA
LEBANON
LATROBE

CHICAGO
PITTSBURGH
DALLAS
DULUTH
YOUNGSTOWN
BETHLEHEM

HOUSTON
PHILADELPHIA
DETROIT
SALT LAKE CITY
MILWAUKEE
ELIZABETH

BOSTON
NEW ORLEANS
SYRACUSE
BANGOR
TOLEDO
BUFFALO

DENVER
ST. LOUIS
BIRMINGHAM
WASHINGTON
COLUMBUS
BALTIMORE

CLEVELAND
KANSAS CITY
PEORIA
JOHNSTOWN
RICHMOND
OMAHA

JACKSONVILLE

THE BARRETT COMPANY, LIMITED

MONTREAL

TORONTO

WINNIPEG

VANCOUVER

ST. JOHN, N. B.

HALIFAX, N. S.

Product

BARRETT CARBOSOTA—*Liquid Creosote Oil for Preserving Wood.*

Description

A highly refined and specially processed coal-tar creosote particularly adapted to surface treatments (brush treatment or painting, spraying and dipping) and the open tank process (hot and cold, or hot and cooling treatment). It conforms to standard specifications.

Coal-tar creosote has been the universally recognized standard wood preservative for over fifty years.

Advantages and Superiority

Carbosota is physically superior to commercial coal-tar creosote for non-pressure treatments because:

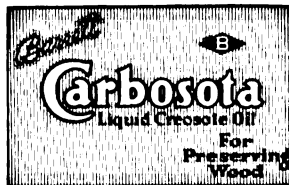
It is liquid at 41° Fahr. (5° C.); free from water; practically non-volatile; does not evaporate or leach from the wood; has high specific gravity. It has low viscosity and being liquid it readily penetrates into the wood, imparting a pleasing, dark brown color. It is a clean, uniform, standardized oil, readily obtainable throughout the United States and Canada.

Carbosota is the recognized "standard" for non-pressure treatments. It conforms to all accepted standard specifications, applicable to these processes.

Methods of Application

Timbers, whether used in buildings or exterior structures, which will be exposed to conditions favorable to the development of decay, should be protected by preservative treatment. Specifications should include detailed requirements as to method of treatment and grade of creosote oil; specific instructions as to procedure and equipment, and provision for inspection.

Where conditions preclude securing properly seasoned timber, the employment of species particularly suitable to treatment by the hot and cooling process may



TRADE-MARK

be employed, and their seasoning conducted by prolonged immersion in Carbosota gradually heated and maintained for a specific period at 215° Fahr.; thereafter, lumber remaining submerged in the Carbosota and both permitted to cool to atmospheric temperature, minimum 50° Fahr. This modification should be applied only under the direct instructions of our engineers and where efficient supervision is available. Thoroughly air-seasoned or kiln-dried lumber is always preferable.

tions of our engineers and where efficient supervision is available. Thoroughly air-seasoned or kiln-dried lumber is always preferable.

Open Tank Process—Consists of impregnating structural wood with refined coal-tar creosote oil (Carbosota Liquid Creosote Oil) by immersion in two baths—first in a hot bath, the oil being at 175° to 200° Fahr., and following this by a cold bath with oil at atmospheric temperature (minimum 50° Fahr.); or by application of the hot and cooling treatment, where the wood remains submerged after expiration of the hot bath, and both oil and wood allowed to cool to the prescribed temperature of the cold bath.

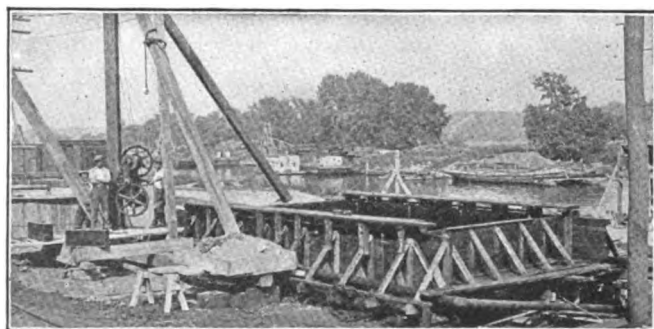
Advantage is taken of the vacuum formed within the wood, due to the differences in temperature, and a good penetration is thus obtained. The duration of the treatment will depend upon the dimensions and species of the timber.

Special detail data relative to quantity of Carbosota required for various species and specifications for treatment are obtainable by addressing nearest office.

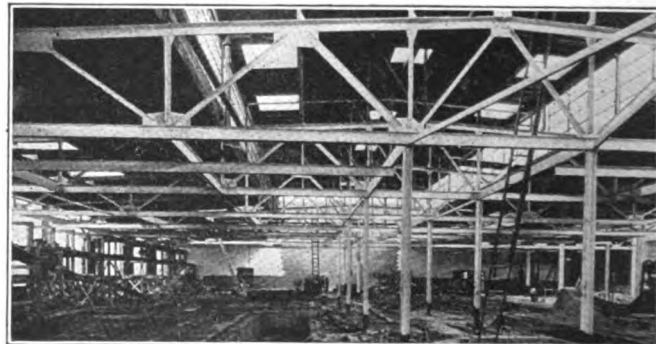
Surface Treatments—Surface applications of preservatives at all points of contact of timbers, such as mortises, tenons and bearings; or where it is the dual purpose of retarding decay as well as decorative painting, may be applied (a) by brush treatment, that is, application of 2 or more coats of Carbosota applied with a broad, wire bound brush; (b) by spraying, which is often preferable because of rapidity with which large areas may be covered; (c) by dipping, that is, complete immersion for short periods of entire stick in heated Carbosota.

Where species readily impregnated are employed, this treatment may be substituted for the open tank process.

Surface treatments require the Carbosota to be heated to about 150° Fahr., when this is difficult or impracticable the oil may be used unheated providing the atmospheric temperature is not less than 50° Fahr.



TANK USED FOR CARBOSOTING 10,000 FT. B. M. OF TIMBER PER DAY BY OPEN TANK PROCESS
(Hot treatment during afternoon, cooling during night; replacing charge in morning)



WOOD ROOF-DECK OF PAPER MILL CREOSOTED BY OPEN TANK PROCESS WITH CARBOSOTA LIQUID CREOSOTE OIL
(Dark ceiling is not a detriment)

IN NEW YORK SINCE 1887

PROTEXOL CORPORATION

SUCCESSOR TO CARBOLINEUM WOOD PRESERVING CO.

Wood Preservatives

36 Barclay Street
NEW YORK, N. Y.
WORKS: KENILWORTH, N. J.

LOCAL REPRESENTATIVES

BOSTON, MASS., 6 Beacon Street, Room 820
CLEVELAND, OHIO, 349 Rockefeller Building

PHILADELPHIA, PA., 149 North 13th Street
NEW ORLEANS, LA., 1024 Maison Blanche Building

SHIPPING DEPOTS

CHICAGO, ILL.

SAN FRANCISCO, CALIF.

HAVANA, CUBA

HONOLULU, T. H.

SAN JUAN, P. R.

Products and Services

PROTEXOL WOOD PRESERVATIVES (formerly Avenarius Carbolineum).

NEOSOTE WOOD PRESERVATIVES.

PROTEXIDE, the colorless preservative.

Also Creosote Oils, all standard grades.

Services include CHEMICAL ANALYSES, RESEARCHES, EXPERIMENTAL WORK, DESIGN and LAYOUT, ESTIMATES for COVERING CAPACITY on submitted timber schedules, and all matters pertaining to CONSULTING PRACTICE on the subject of Timber Preservation.

Uses—General

For brush, spray, or open tank treatments: To prevent the deterioration of wood placed in situations where decay is likely—as sills and foundation timbers, screeds or nailing pieces in concrete—or where wood-work is used in situations where an optimum moisture condition prevails.

As a permanent walnut stain for shingles, half timbers, trellises, arbors, etc.

Experience

Protexol has been successfully used for the surface treatment of timber to prevent its decay, by brush, spray or open tank application, for 46 years, under its former name. Protexol (protects all) represents value demonstrated by actual time tests—by results.

Technical Descriptions and Recommendations

Protexol Wood Preservative No. 1—A non-volatile, heavy oil derived from the highest boiling distillate of coal tar. Its constituents belong to the anthracene group, the permanent antiseptic properties of which are generally acknowledged. After filtration and refining, the oil is chemically treated to improve its character and to increase its efficiency. Made to the 46-year old standard of quality. For protecting timber against premature decay this grade is recommended as the very best preservative—specifically where only brush or spray treatments are to be given. Where inflammability of the treated timber is the important factor, we unreservedly recommend the use of Protexol Wood Preservative No. 1. Specific gravity, 1.10 to 1.115 at 38° C.

Protexol Wood Preservative No. 2—A straight run anthracene oil to meet the chemical standard for what is known as the carbolineum type. Whenever the higher cost of Protexol No. 1 does not appear justifiable, either owing to construction requiring a heavier open tank treatment, because the construction is not of a permanent character or for other sound reasons, Pro-



PRESERVES WOOD EVERYWHERE
TRADE-MARK

texol No. 2 is recommended. Where waterproofing is the prime object sought to be attained, this grade is suggested. Specific gravity, 1.09 to 1.13 at 38° C.

Neosote Wood Preservative No. 1—

A mixture of the lighter anthracene oils obtained in redistilling to produce Protexol Wood Preservatives and heavy creosote oils. Liquid at all temperatures. Neosote is recommended for heavy open tank treatments where depth of penetration only is considered the measure of preservation, or as a temporary preservative agent, or where the only object in using any preservative is high initial toxicity to destroy organisms on timber placed under conditions where decay is not likely if sound timber is used. Where the lowest cost compatible with a satisfactory return on the investment is sought, we advise Neosote. Specific gravity, 1.08 to 1.11 at 38° C.

Neosote No. 2—Heavy creosote oils of minimum specific gravity of 1.06 at 38° C.

Notes: It is worth bearing in mind that the item of labor cost will be substantially the same in the application of any one of the four grades. Equipment cost will likewise be substantially the same except where heavy open tank treatments are desired.

Protexol No. 2 and Neosote are more volatile and their use is not expected to insure the factor of safety to be had from the use of Protexol No. 1, except that a larger quantity of Protexol No. 2 and Neosote will probably give the same results as a smaller quantity of Protexol No. 1.

Protexide—A sodium fluoride preparation, colorless, odorless, applied in an aqueous solution of 3% to 5%. Specially suitable where treated surfaces require the subsequent application of varnish or decorative paint. Applied by brush, open tank or pressure.

Specifications for Use

See former editions of SWEET'S CATALOGUES or Leaflet 23.

These are designed especially to meet the requirements of each case and include a consideration of the conditions to be met and the kind and quality of timber to be used. Cost estimates will be prepared when schedule of timber is submitted.

Literature

A list of all available bulletins and circulars will be sent on request. Each answers definite questions.

Leaflet 23—Suggested Specifications.

Circular 68—Deterioration of Timber and Its Causes.

Circular 89—The "How" of Surface Treatments.

Bulletin 40—The Annual Charge Against Treated Timber.

MISSISSIPPI GLASS CO.

TELEPHONE
MADISON SQUARE 9370

220 Fifth Avenue
NEW YORK, N. Y.

BRANCH OFFICES

CHICAGO, ILL., 7 West Madison Street

ST. LOUIS, MO., 4070 North Main Street

Products

The best quality of FIGURED BUILDING GLASS and STANDARD ROUGH and RIBBED GLASS for Skylights.

Description

Apex is a very high quality figured glass with the smooth surface polished, making it most brilliant and desirable for high class work. All other patterns are figured rolled glass with a natural smooth surface.

Adaptability

Our various patterns make it possible while erecting a building to install a figured glass which correctly conforms with any style of architecture.

Advantages

Brilliance, strength, true cutting surface, power of light diffusion, uniformity of color, originality of design and excellence of manufacture, combined with moderate cost.

Light Diffusion

The experiments conducted by Prof. Charles L. Norton of the Massachusetts Institute of Technology, on behalf of the Associated Factory Mutual Insurance Companies of New England, demonstrated that a proper combination of glass surfaces insures for a given floor area a vastly increased efficiency of light over that to be had by plain glass. Our Ribbed, Maze, and other figured surfaces of glass are designed in accordance with the basic requirements developed by Professor Norton's experiments.

PLAIN FIGURED BUILDING GLASS AND STANDARD ROUGH AND RIBBED GLASS

Type	Thickness, in.	Maximum width, in.	Maximum length, in.	Approximate weight per sq. ft., lbs.
Factrolite.....	$\frac{1}{8}$	48	130	2
Factrolite.....	$\frac{3}{16}$	48	130	2½
Maze.....	$\frac{1}{8}$	48	130	2
Maze.....	$\frac{3}{16}$	60	130	2½
Florentine.....	$\frac{1}{8}$	48	130	2
Florentine.....	$\frac{3}{16}$	60	130	2½
Syenite.....	$\frac{1}{8}$	48	130	2
Syenite.....	$\frac{3}{16}$	60	130	2½
Muranese.....	$\frac{1}{8}$	42	110	2
Ondoyant.....	$\frac{1}{8}$	30	100	1½
Fig. No. 2.....	$\frac{1}{8}$	42	110	2
Fig. No. 2.....	$\frac{3}{16}$	42	110	2½
Rough.....	$\frac{1}{8}$	48	130	2
Rough.....	$\frac{1}{16}$	48	130	2½
Rough.....	$\frac{1}{4}$	48	130	3½
Rough.....	$\frac{3}{8}$	48	130	5½
Rough.....	$\frac{1}{2}$	48	130	7½
Ribbed.....	$\frac{1}{8}$	48	130	2
Ribbed.....	$\frac{1}{16}$	48	130	2½
Ribbed.....	$\frac{1}{4}$	48	130	3½
Ribbed.....	$\frac{3}{8}$	48	130	5½
Ribbed.....	$\frac{1}{2}$	48	130	7½
Pentecor.....	$\frac{1}{8}$	48	130	2
Pentecor.....	$\frac{3}{16}$	48	130	2½



IDENTIFICATION LABEL



42D STREET AND MADISON AVENUE BUILDING, NEW YORK
All corridor doors and partitions glazed with Mississippi glass

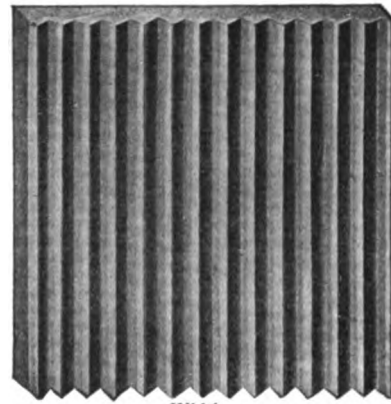
Ordering

Glass being one of the last materials to go into a building, it is often not ordered far enough ahead to give the manufacturer time to cut the glass to sizes and make shipment in time to enclose the building by the date desired. It is therefore advisable to give this point consideration in due time, as the tremendous demand for figured glass necessitates orders taking their turn as they are received.

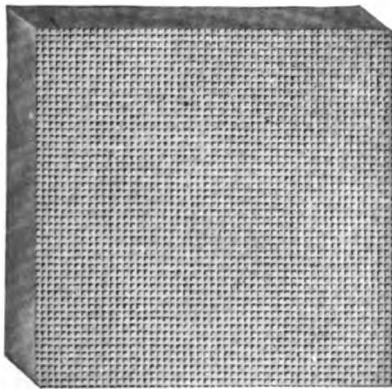
In ordering, always specify width first.

Specifying

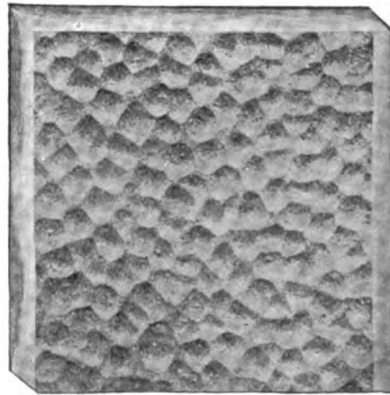
By specifying any of the patterns manufactured by the MISSISSIPPI GLASS CO., the architect is insured against the substitution of inferior glass.



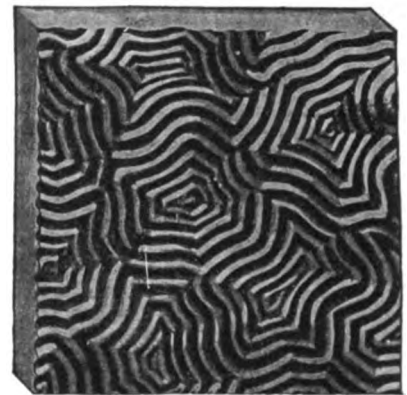
—Width—
PENTECOR GLASS



—Width—
FACTROLITE GLASS



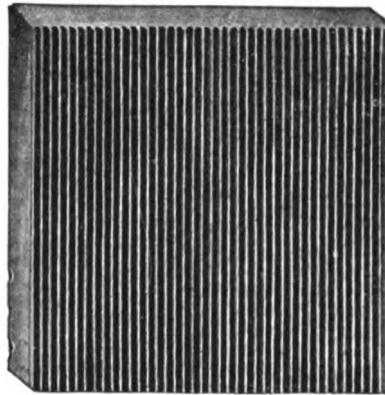
—Width—
ROUGH GLASS



—Width—
FIGURE NO. 2 GLASS



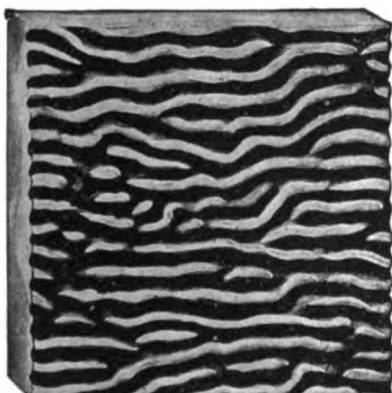
—Width—
MURANESE GLASS



—Width—
RIBBED GLASS



—Width—
FLORENTINE GLASS



—Width—
ONDOYANT GLASS



—Width—
MAZE GLASS



—Width—
SYENITE GLASS

MISSISSIPPI WIRE GLASS COMPANY

TELEPHONE
MADISON SQUARE 9370

220 Fifth Avenue
NEW YORK, N. Y.

BRANCH OFFICES

CHICAGO, ILL., 7 West Madison Street

ST. LOUIS, MO., 4070 North Main Street

Product

"WIRE GLASS," for Windows and for Vault Lights.
For Figured Building Glass and Standard Rough and Ribbed Glass for skylights, see pages 318-319.

Mississippi "Wire Glass"

The MISSISSIPPI WIRE GLASS COMPANY is the original manufacturer of solid "Wire Glass," and its product is universally recognized as the standard wire glass, being the material upon which the underwriters' standard was based in 1899.

By our process of manufacture, Standard "Wire Glass" is cast solid, and has an average of fewer imperfections than any other wire glass on the market.

"Wire Glass," is rolled plate glass having a wire netting embedded equidistant from either surface. This process is automatically effected while the glass is in a molten state and, therefore, insures homogeneous and solid "Wire Glass."

The quality of metal and process of manufacturing standard "Wire Glass" produce the very highest quality, with a tensile strength second to none.

Adaptability

The object of "Wire Glass" is to afford perfect and constant fire protection at a minimum cost, at the same time admitting and diffusing the light. It is particularly suitable for use in windows, doors, transoms, monitors, skylights and all places where fire or break-age protection is required.

Light Diffusion

The light may be increased in a room 30 ft. or more deep to from 3 to 15 times its present effect by using Maze, Syenite, Factrolite, Pentecor or Ribbed "Wire Glass," instead of plain glass in the upper sashes.

Conducting Condensation

"Pentecor," when installed in skylights set at a proper angle, will conduct condensation and prevent dripping.

Advantages

When employed as above mentioned, "Wire Glass" may be fractured by severe heat or sudden shock, but the wire mesh will hold the shattered pieces in place, preventing their falling and causing serious injury or loss of life. It will also prevent draught and hold a fire within the bounds of its origin.

Underwriters' Requirements, Extract from Rules (1905)

(2) **Size of Glass**—(a) The unsupported surface of the glass allowed shall be governed by the severity of exposure and be determined in each case by the Underwriters having jurisdiction, but in no case shall it be more than 48 in. in either dimension or exceed 720 sq. in. (b) The glass to be of such dimensions, after selvage is removed, that the bearing in the groove or rabbet is not to exceed $\frac{1}{8}$ in. less than the full depth called for in rules 6 and 7. (c) The glass to be retained by the structural part of the frame or sash independently of the material which may be used for weatherproof purposes. Only non-inflammable material to be used in setting glass in the sash.



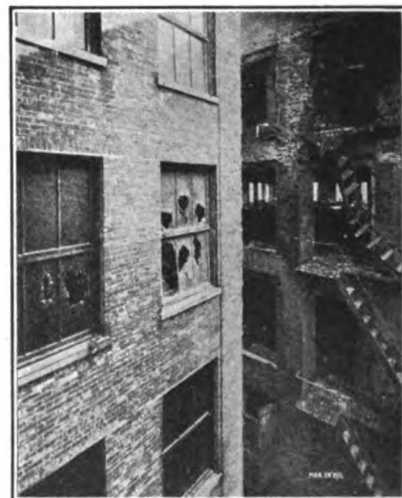
THIS LABEL (PRINTED IN RED) APPEARS ON EVERY PIECE OF THE STANDARD PRODUCT

MISSISSIPPI "WIRE GLASS"

Style	Thick- ness, in.	Maximum width, in.	Maximum length, in.	Approximate weight per sq. ft., lbs.
Polished.....	$\frac{5}{16}$	48	130	4
Polished.....	$\frac{3}{8}$	30	72	8
Maze.....	$\frac{1}{4}$	48	130	5 $\frac{1}{2}$
Maze.....	$\frac{3}{8}$	48	130	5 $\frac{1}{2}$
Factrolite.....	$\frac{1}{4}$	48	130	5 $\frac{1}{2}$
Factrolite.....	$\frac{3}{8}$	48	130	5 $\frac{1}{2}$
Syenite.....	$\frac{1}{4}$	48	130	5 $\frac{1}{2}$
Rough.....	$\frac{1}{4}$	48	130	5 $\frac{1}{2}$
Rough.....	$\frac{3}{8}$	48	130	5 $\frac{1}{2}$
Ribbed.....	$\frac{1}{4}$	48	130	5 $\frac{1}{2}$
Ribbed.....	$\frac{3}{8}$	48	130	5 $\frac{1}{2}$
Pentecor.....	$\frac{1}{4}$	48	130	5 $\frac{1}{2}$
Pentecor.....	$\frac{3}{8}$	48	130	5 $\frac{1}{2}$

VAULT OR FLOOR LIGHTS

Rough "Wire Glass".....	$\frac{3}{4}$	12	12	9 $\frac{1}{4}$
Ribbed "Wire Glass".....	$\frac{3}{4}$	12	12	9 $\frac{1}{4}$
Ground "Wire Glass".....	$\frac{3}{4}$	12	12	9 $\frac{1}{4}$



ASCH BUILDING AND ADJOINING BUILDING, NEW YORK, N. Y.

Typifying efficiency in modern fireproof construction, of "Wire Glass," as compared to inefficiency of old-style metal shutters with which the Asch Building was equipped.

Note the holes punched in the wire glass windows of the adjoining building by the firemen, to enable them to fight the fire from a point of safety, the wire glass windows forming a fire shield.

Reliability

Mississippi "Wire Glass" having an indisputable reputation of being a superior product to the standard makes, the company offers no guarantees as an inducement to stimulate sales. Customers know what they are getting when Mississippi "Wire Glass" is specified and installed.

How to Specify

(Specify outright by name, and be protected.)

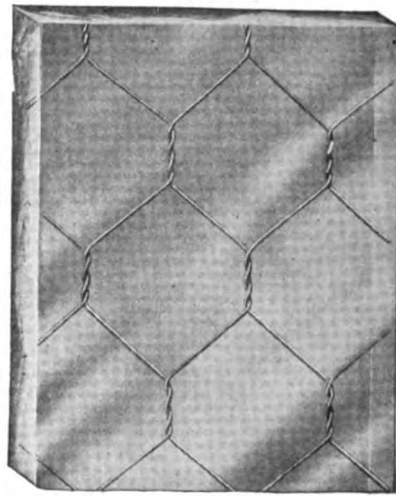
"Wire Glass" shall be installed in [specify location] and in all places marked W. G. on plans and elevations.

The "Wire Glass" to have a thickness of at least $\frac{1}{4}$ in. at thinnest point. Wire mesh to be not larger than $\frac{3}{4}$ in., and no wire used for such mesh to be smaller than No. 24 B. and S. gage. Plane of the wire mesh to be practically midway between the two surfaces of the glass.

Selva shall be removed from glass before framing.

[State here type or types of glass to be used and where.]

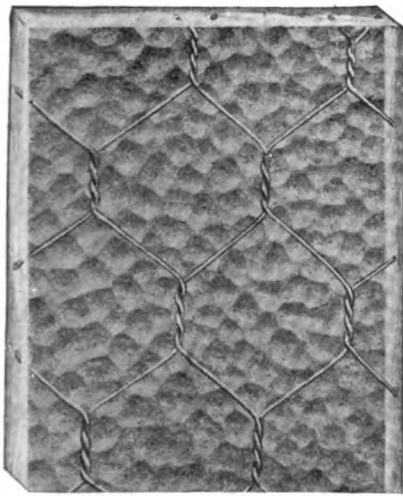
Note: Where the recognized standard and perfected product is required, specifications should call for "Wire Glass," the product of MISSISSIPPI WIRE GLASS COMPANY.



—Width—

POLISHED "WIRE GLASS"

Sizes up to 48 in. wide and 130 in. long
Thicknesses about $\frac{1}{4}$ and $\frac{3}{8}$ in.



—Width—

ROUGH "WIRE GLASS"

Sizes up to 48 in. wide and 130 in. long
Thicknesses $\frac{1}{4}$ and $\frac{3}{8}$ in.



—Width—

MAZE "WIRE GLASS"

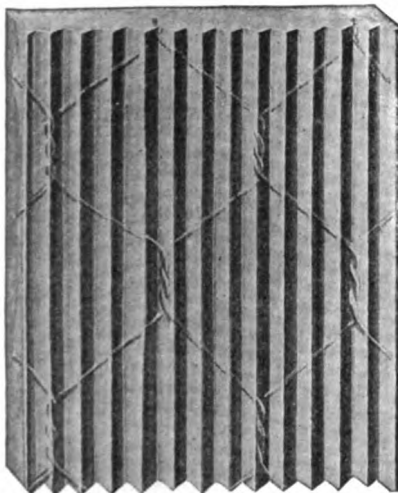
Sizes up to 48 in. wide and 130 in. long
Thicknesses $\frac{1}{4}$ and $\frac{3}{8}$ in.



—Width—

SYENITE "WIRE GLASS"

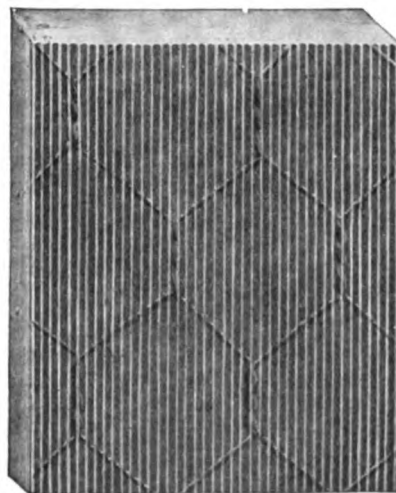
Sizes up to 48 in. wide and 130 in. long
Thickness $\frac{1}{4}$ in.



—Width—

PENTECOR "WIRE GLASS"

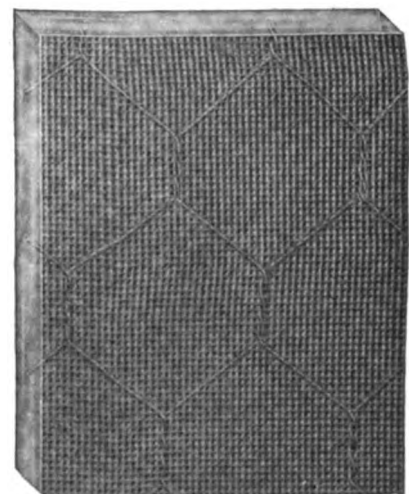
Sizes up to 48 in. wide and 130 in. long
Thickness $\frac{1}{4}$ in.



—Width—

RIBBED "WIRE GLASS"

Sizes up to 48 in. wide and 130 in. long
Thicknesses $\frac{1}{4}$ and $\frac{3}{8}$ in.



—Width—

FACTROLITE "WIRE GLASS"

Sizes up to 48 in. wide and 130 in. long
Thicknesses $\frac{1}{4}$ and $\frac{3}{8}$ in.

Factrolite for Industrial Buildings

Efficiency of Factrolite—The MISSISSIPPI WIRE GLASS COMPANY has had practically every kind of glass tested to determine efficiency in light transmission and finds Factrolite to be far ahead of anything else suitable for installation in industrial buildings.

The accompanying report and plotting speak for themselves.

Test of Factrolite—The tests were made by measuring the distribution of light in two planes perpendicular with each other, with light from an incandescent lamp 3 ft. distant falling normally upon and passing through the glasses. The relative light intensities are recorded in per cent of the normal (0°—normal—equals 100%).

REPORT No. 24558
DISTRIBUTION OF LIGHT TRANSMITTED THROUGH
FACTROLITE—INCIDENT LIGHT ON ROUGH
SIDE OF GLASS—RELATIVE LIGHT
INTENSITIES

Angles	First Plane		Plane Perpendicular to First Plane	
	Right	Left	Right	Left
0 (Normal)	100%		100%	
2½	60.5	86.5	85.2	75.4
5	41.8	51.8	41.0	28.9
7½	24.0	30.6	15.8	13.8
10	9.88	13.3	1.33	9.14
15	1.43	4.45	.39	1.31
20	.101	.81		

Total light transmitted through Factrolite incident light normal on rough side of glass: 84.5%.

Economy of Factrolite—Today, as never before, owners of industrial buildings are coming to realize that the utilization of daylight to its fullest extent by the use of proper glass means the conservation of energy required for artificial lighting, and the maximum production of the employees.

Whereas more heat is required to maintain a given

temperature in a building with 80% of its wall area glass than is required for a wall area of 20% glass, this additional heat is required for only five months of the year, whereas with the 20% glass area, it is necessary to artificially light the building a large part of the time.

Factrolite breaks up the rays of the sun, diffusing the light and distributing it equally.

Inspection Invited—Before placing a contract for glass, those interested are urged to get a sample of Factrolite and compare it with every other make of glass recommended for industrial buildings.

Without a doubt, they will become convinced that Factrolite offers the maximum of lighting efficiency with the minimum of cost, thus reducing the overhead and cost of maintenance, and increasing the efficiency of manufacturing the commodities.

**Tests Made by the Electrical Testing Laboratories
Showing Transmission and Illumination**

Test Report No. 28482 rendered to the MISSISSIPPI WIRE GLASS COMPANY on the distribution of illumination through figured sheet glass windows in a model room made by the Electrical Testing Laboratories of New York City.

Object—An investigation to study the distribution of daylight illumination in a room with various types of ¼-in. figured sheet glass used in the window.

Test Room—Model—Representing a room 50 by 100 by 14 ft.

Scale—1 ft. equals 25 ft. (24 by 48 by 7 in.)

Windows—Continuous on one side of room 3 ft. high, sill 4 ft. from floor.

Ceiling and Walls—White glass finish (commercial factory paint).

Floor—Brown linoleum (having reflection factor of average factory floor.)

Test Stations—Test stations in five lines, as shown.

Source of Light—Concentrated filament incandescent lamp, representing the sun at 30° from horizon. The intensity of the sun was approximately proportioned to the size of the room.

Sky uniformly bright within $\pm 20\%$.

Light within the room—direct sunlight, 80%; sky-light, 20%.

Result of Tests—Transmission of light through glass samples, in per cent of clear glass. Clear Glass taken as 100%.

Rough wire.....	98%
Syenite.....	87%
Maze wire.....	82%
Factrolite wire.....	88%
Pentecor wire horizontal.....	90%
Pentecor wire vertical.....	94%
Ribbed vertical.....	96%
Ribbed horizontal.....	99%

Horizontal illumination of working plane, equivalent to 40 in. above floor.

Samples

Samples of the MISSISSIPPI WIRE GLASS COMPANY'S products are filed with the Architects Samples Corporation, New York City.

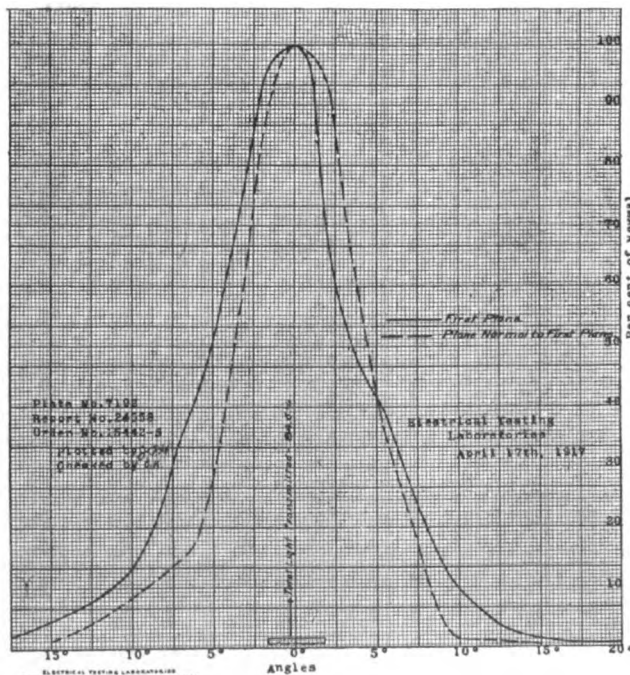
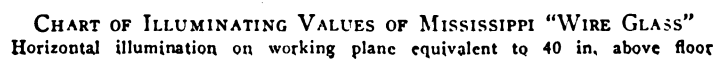


CHART SHOWING EFFICIENCY IN LIGHT TRANSMISSION
WITH FACTROLITE



WALTER COX, PRESIDENT

PENNSYLVANIA WIRE GLASS COMPANY

CABLE ADDRESS

"WIRE GLASS, PHILADELPHIA"

EXECUTIVE OFFICE
 Pennsylvania Building
 PHILADELPHIA, PA.

WORKS
 DUNBAR, PA.

Products

WIRE GLASS: Rough, Ribbed, Figured (Cobweb and Florentine), Aqueduct (drip-proof), Polished (transparent).

CORRUGATED WIRE GLASS.

Also, Glass without wire: Rough, Ribbed, Figured (Cobweb and Florentine).

Wire Glass

Process—Solid wire glass, made by the Pennsylvania continuous process, is formed complete by one pouring and one rolling. It is the only process that makes possible the manufacture of wire glass as thin as $\frac{1}{8}$ in.

Fire Protection—Wire glass is a valuable fire retardant, and therefore a safeguard to human life, and an important factor in the reduction of insurance rates. It is insisted upon by insurance underwriters in all instances where there is any fire hazard.

Approval (Distinguishing Mark)—All of our wire glass $\frac{1}{4}$ in. and over in thickness has the full approval of the National Board of Fire Underwriters, as a fire retardant, which requires a distinguishing mark to identify the glass. Our distinguishing mark is our *cabled strand*, appearing every 10 in. across the sheet and the full length of each sheet of wire glass.

Estimates—We offer gratuitous engineering advice on all glass problems. Quantities will be listed from drawings furnished this company and approximate estimates provided as well as working drawings to suit particular requirements.

Samples—Request for samples and catalogues should be made to the main office in Philadelphia, Pa., where they will be promptly acknowledged.

Specifications—Engineers should always specify "Solid Wire Glass manufactured by the PENNSYLVANIA WIRE GLASS COMPANY," and "to comply with the rules and regulations of the National Board of Fire Underwriters."

Corrugated Wire Glass

Corrugated wire glass is made to meet the demand for a substantial glass for all types of industrial buildings where maximum admission of diffused daylight is essential.

Uses—It is especially suited for entire roofs and sidewalls; parts of roofs and sidewalls; skylights of all forms and shapes; canopies and marquees; partitions in workshops; for sheltering loading platforms; for covering areas and light-walls; and in every place where light is required. It is adaptable to old structures as well as new. Can be used with other corrugated materials.

How Manufactured—Corrugated wire glass is manufactured by the original Pennsylvania "Solid" process, which consists of rolling the completed



sheet of wire glass by one continuous operation.

Thickness—C.W.G. is made about $\frac{5}{16}$ in. thick.

Sizes—Made in sheets of four standard sizes as follows: Deep angle, $27\frac{3}{4}$ in. wide by 42 and 63 in. long. Shallow angle, $26\frac{1}{2}$ in. wide by 42 and 63 in. long. Special sizes can be furnished up to $55\frac{1}{2} \times 126$ in. in deep angle, and 53×126 in. in shallow angle, but standard sizes are recommended for use wherever possible.

Weight—C.W.G. weighs about $4\frac{1}{2}$ lbs. per sq. ft.

Strength—Corrugated wire glass has a strength much greater than any other wire glass of equal thickness. It will support itself without the aid of any special roof members. When assailed by shocks or attacked by fire it does not splinter and fly apart in the manner common to plain glass.

During tests made by the Philadelphia Building Inspectors, a sheet $27\frac{1}{2}$ in. wide by 66 in. long (62-in. clear span) sustained an equally distributed load of 800 lbs. or an average of about 70 lbs. per sq. ft.

Installation—The sheets of glass are fastened together by means of metal strips and asphalt strips, sufficient room being allowed between sheets for expansion (see illustrations on following page). The metal strips are attached to the purlins by clips. Each joint of glass is in reality an expansion joint and gives to the roof or sidewall a highly desirable combination of flexibility and rigidity, as well as being absolutely watertight. Corrugated wire glass can be used in conjunction with corrugated iron or corrugated asbestos and other building materials. It can be easily and quickly attached to or erected upon the main structure or original framework of any building, in any position, and can be installed by unskilled labor.

All necessary fittings such as cover caps and inner strips, iron clips, bolts, lead washers, protective paint and asphalt strips will be furnished with glass, if desired, at moderate prices.

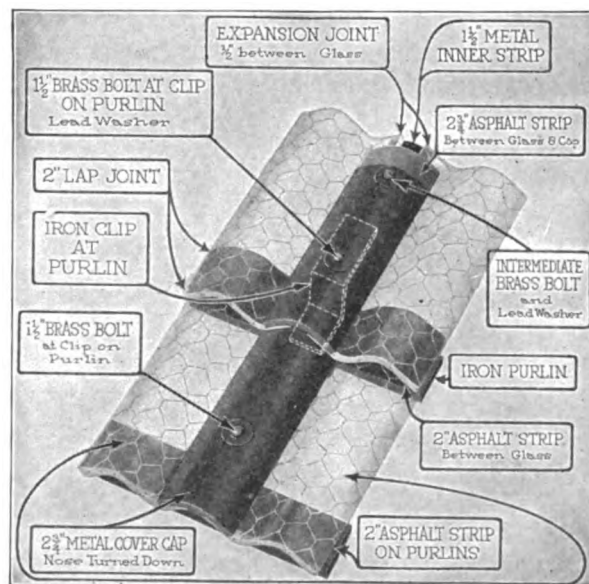
Advantages of Corrugated Wire Glass

Corrugated wire glass very satisfactorily diffuses light rays and eliminates annoying shadows and glare, giving a uniform and soft-lighting effect.

Its use in sidewalls and roofs affords great saving in steel.

The glass has a smooth finished surface which makes it difficult for dust and dirt to collect. Grease, dirt and other foreign substances can be easily removed. Ordinary rains keep the glass very clean.

Corrugated wire glass has the approval of the

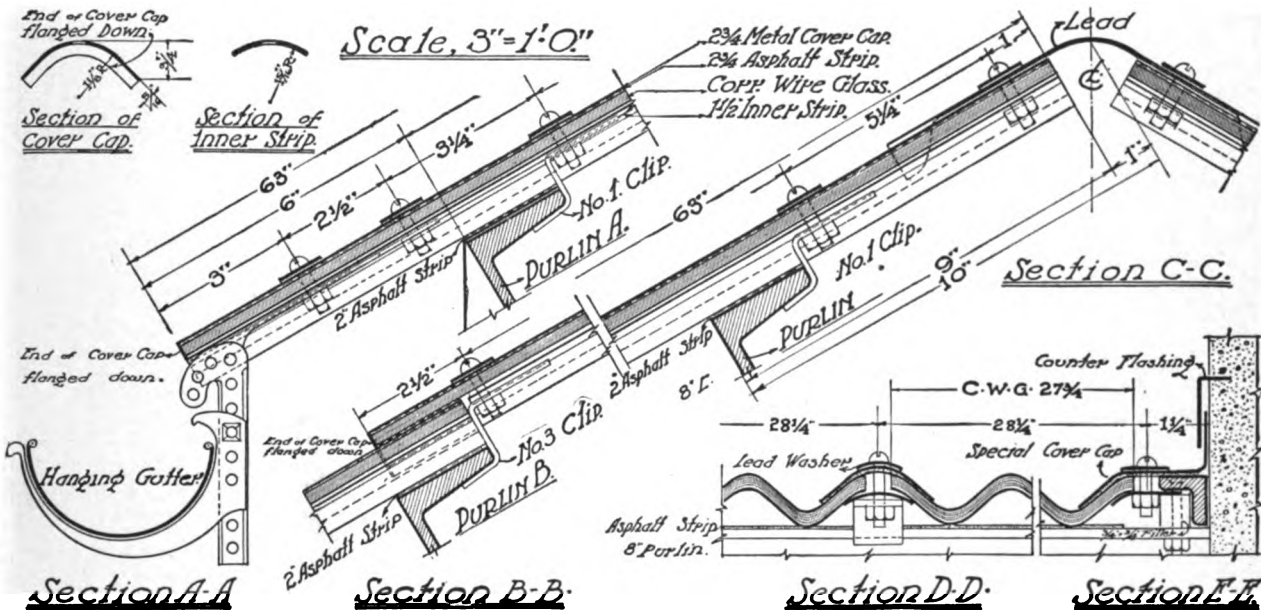
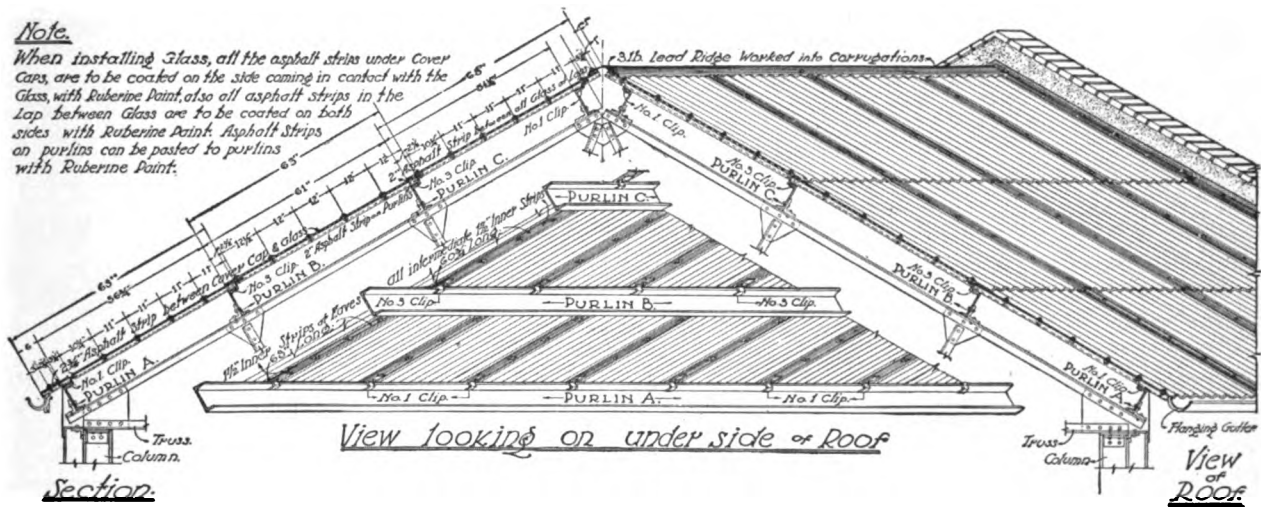


CORRUGATED WIRE GLASS

Makes daylight buildings. Note how C.W.G. is attached at purlins and the various parts required to install same

Note.

When installing glass, all the asphalt strips under cover caps are to be coated on the side coming in contact with the glass with Ruberine Paint, also all asphalt strips in the lap between glass are to be coated on both sides with Ruberine Paint. Asphalt strips on purlins can be posted to purlins with Ruberine Paint.



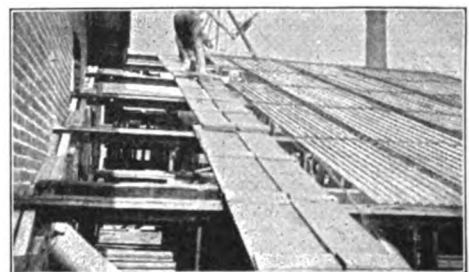
DETAILS SHOWING ROOF CONSTRUCTION OF CORRUGATED WIRE GLASS



C. W. G. SKYLIGHT



ALL C. W. G. BUILDING
Note interior lighting effect



C. W. G. ROOF

National Board of Fire Underwriters and meets with their every requirement as a fire retardant glass. Its use in exposed openings reduces insurance.

Specifications for Installation of C. W. G.

All glass shown or marked "C. W. G." on plans to consist of corrugated wire glass manufactured by the Pennsylvania "Solid" process. Roof purlins should be spaced 5 ft. 1 in. center to center, if I-beams, or back-to-back, if channels, which allows 2 in. for lap at end joints. For siding, the spacing of the T-iron girts should be 5 ft. 3 3/4 in. center to center of supporting girts.

Method of Laying—Lay glass edge to edge and allow space between the sheets of glass. Cover joints with a 2 3/4 in. asphalt strip covered with protective paint on side next to glass, the full length of sheet of glass. Then cover with a 2 3/4 in. No. 24 gauge metal strip, full length of glass and underneath

place a 1 1/2 in. metal strip. The main fasteners to be hooked to purlins with reinforcing clips securely fastened with 1/4 x 1 1/2 in. rustproof stove bolts with lead washers placed on top of cover strip. Between the purlins or main fasteners, put in intermediate fasteners, not over 12 in. centers, consisting of rustproof 1/4 x 1 in. stove bolts with lead washers securely screwed down. Tighten bolts snugly so as not to strain glass.

Roofing—Always have laps of glass come over purlins. Lay on purlins a 2 in. asphalt strip coated with Ruberine Paint; also lay a 2 in. asphalt strip, coated on both sides with Ruberine Paint, between glass at lap.

Accessories—Provide all metal caps and inner strips, bolts, washers, clips, protective paint, asphalt strips, etc., necessary to make a watertight and workmanlike job. Provide 2 coats of protective paint for all metal work.

Provide ridge roll, securely bolted to purlins; all spaces to be made watertight by filling in with elastic cement.

THE WESTERN GLASS COMPANY

Manufacturers of Figured and Wire Glass

STREATOR, ILL.

Products

FIGURED GLASS; WIRE GLASS, Plain and Figured;
ROUGH and RIBBED GLASS; SHEET PRISM GLASS;
POLISHED WIRE GLASS.

Figured Glass

This is designed for use in hallways, areas, interior partitions, and similar constructions, where the admission of light without transparency is desired.

Made of the best materials obtainable and moulded in attractive patterns, it adds materially to the decorative effects of such installations.

Its distinctive advantages for this service have given it an established reputation.

Designs—The figured glass is made up in a large number of designs, some of which are illustrated in the accompanying cuts. This glass can be supplied to match any style of architecture and to conform to architect's or builder's requirements.

Sizes and Weights—Made in thicknesses of $\frac{1}{8}$, $\frac{3}{16}$ and $\frac{1}{4}$ in., with maximum dimensions of 48x120 in., and 48x132 in.

Rough and Ribbed Glass

Especially adapted for heavy service in skylights, partitions and factory windows.

Sizes—Made in thicknesses of $\frac{1}{8}$, $\frac{3}{16}$, $\frac{1}{4}$, $\frac{3}{8}$ and $\frac{1}{2}$ in., with maximum dimensions of 48x120 in. for $\frac{1}{8}$ -in. thickness, and 48x132 in. for other thicknesses.

The $\frac{3}{4}$ -in. thick glass is furnished in rough glass or rough wire glass in cut sizes, not in stock sheets.

Solite Glass

Used where the maximum *diffusion* of light, as well as the maximum *amount* of light is required.

Nearly 200,000 sq. ft. of $\frac{1}{4}$ -in. Solite Wire Glass

was specified and used in the Naval Supply Base building, Brooklyn, N. Y.

Special samples of Solite Glass sent on application.

Wire Glass

Wire glass can be furnished in any of the regular figured designs or in polished transparent sheets, as desired.

It is made by a single-pour process, and the reinforcement is a special wire fabric of our own design, with 3 twists and 5 loops at the vertical strand.

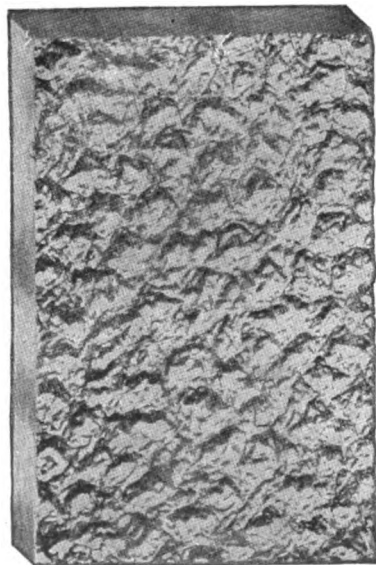
By our method of manufacture, this wire fabric is incorporated in the sheet of molten glass while it is being rolled. This makes the finished product better able to stand severe strains and sudden temperature changes. The wire strand used is so thin that it does not obstruct the light and is scarcely noticeable under ordinary conditions.

Fire and Accident Prevention

The main reason for using wire glass is the reduction of the fire and accident hazards. Properly installed, wire glass furnishes an effective barrier to the spread of flames through exposed windows and other openings.



RADIANT FIGURED GLASS



MOSS FIGURED GLASS



CARNATION FIGURED GLASS



COMET FIGURED GLASS

In this connection our product has stood the severe tests imposed by the Underwriters' Laboratories, Inc., and has been fully approved by the Fire Underwriters' Association.

Each sheet bears the identification marks of the Underwriters' Laboratories, Inc.

In windows subject to heavy wind pressures or liable to injury from carelessness or from flying bodies, the installation of wire glass insures against injury to pedestrians from falling glass and against the resulting damage suits.

Sizes—Made in thicknesses of $\frac{1}{4}$, $\frac{3}{8}$ and $\frac{1}{2}$ in., sizes up to and including 48 in. wide by 132 in. long.

Standard wire glass is made as near as possible to $\frac{5}{8}$ in. thick in accordance with the rules of the Underwriters' Laboratories, Inc., covering standard construction of fireproof windows and skylights.

All kinds of wire glass furnished in the standard $\frac{1}{4}$ - and $\frac{3}{8}$ -in. thickness.

Wire glass is furnished in other thickness as called for by engineering requirements.

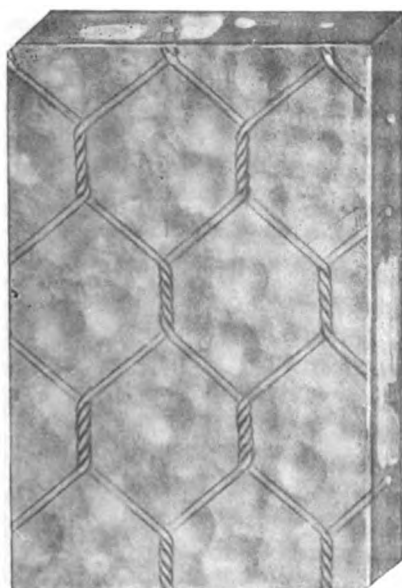
Sheet Prism Glass

Where it is desired to project daylight well back into an interior, our sheet prism glass is an effective glazing medium for producing the maximum lighting efficiency.

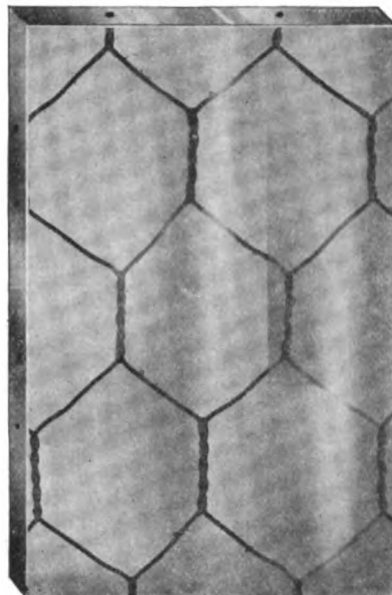
Furnished in standard thickness and in sizes up to 50 in. wide and 132 in. long.

WEIGHTS OF GLASS PACKED FOR SHIPMENT

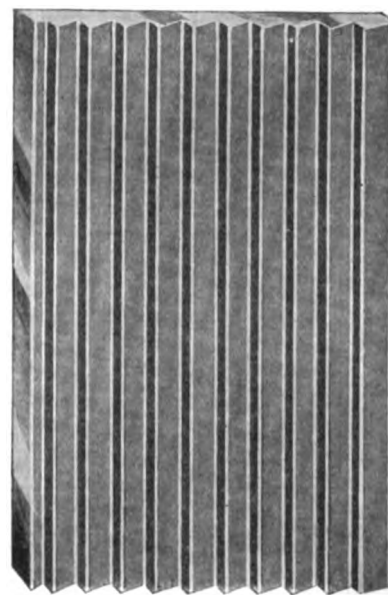
Thickness, in.	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{5}{8}$
Weight, lbs. per sq. ft. . . .	2 $\frac{1}{2}$	3 $\frac{1}{2}$	4 $\frac{1}{2}$	6	8	11



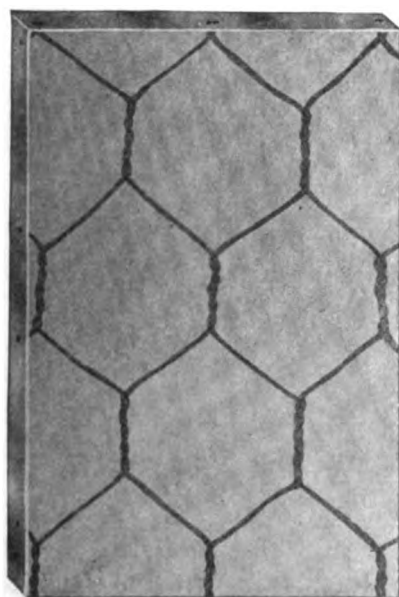
SOLITE WIRE GLASS



ROUGH WIRE GLASS



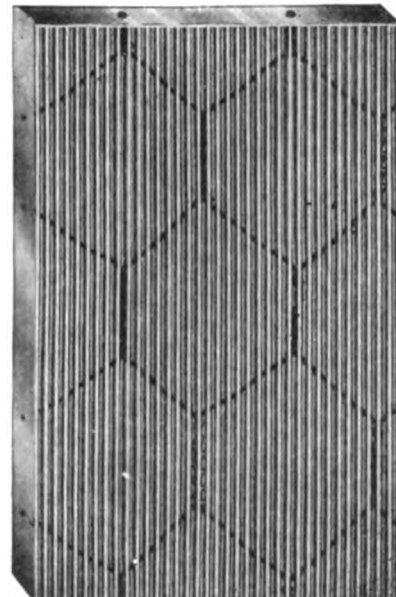
SHEET PRISM GLASS



POLISHED WIRE GLASS



HOLLY WIRE GLASS



RIBBED WIRE GLASS

NATIONAL STEEL DOOR CO.

ESTABLISHED 1910

310 South Canal Street
CHICAGO, ILL.

Product

"DURABLE" STEEL DOORS and FRAMES.

"Durable" Hollow Steel Doors

The demand for steel doors and frames to meet the rigid requirements of industry caused us to investigate carefully these requirements for industrial buildings.

We have perfected, after years of exhaustive research and experimentation, a door so designed and constructed as to render maximum satisfaction.

National Steel "Durable" Doors, with a superiority in every function to wood, insure to the purchaser freedom from warping, structural strength, the ability to withstand rough usage and maximum resistance to fire. For these reasons the cost of maintenance and operation is reduced to a minimum when "Durable" steel doors are used in factory, warehouse, garage, freight-house, powerhouse, pumping station, or other industrial buildings.

Types—"Durable" Doors can be furnished in the following types: Swinging, sliding, jack-knife, vertical lift, compound, counterbalanced, single or in pairs.

Stock sizes are shown in the illustrations. Any other sizes or panel designs for any make of surface or mortised hardware can be furnished promptly. Use stock sizes wherever possible and save additional expense.

Specifications for National Steel "Durable" Doors

Material—Stiles, rails and panels throughout are made of Nos. 12 and 14 gauge National alloy steel, containing sufficient copper content to give the steel a great degree of rust resisting quality.



TRADE-MARK

Construction—The stiles and rails are formed in tubular shapes and welded entirely together at points of connections by the acetylene process, making a perfect homogeneous joint. The panels are electrically welded to stiles and rails. Cork insulation is inserted in the hollow chambers of the stiles and rails to properly insulate the door and eliminate the transmission of heat, cold and sound.

When doors are used in pairs astragals are provided $\frac{1}{2}$ in. for full height of doors, securely fastened to one leaf of each pair.

Assembling and Painting—Before the doors are assembled the interior of stiles and rails are painted with red lead and oil. After assembling, all exterior surfaces are painted with battleship gray paint, thoroughly brushed on. All drilling, tapping and attaching of hardware is done in the factory before doors are shipped.

Glazing—When doors are to have glass panels, they are equipped with removable glazing angles. Glass is not furnished with doors. Any kind of glass may be employed in "Durable" Doors.

Specifications for National Steel "Durable" Frames, Types Nos. 14 and 14SS

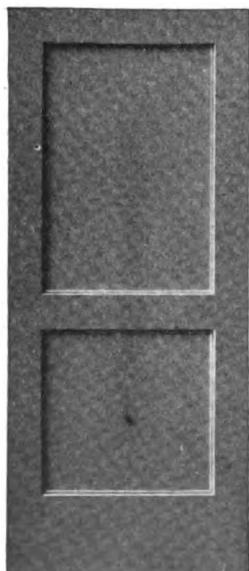
Material and Construction—Frames are made of No. 14 gauge cold rolled steel pressed to shape. Corners are acetylene welded together and ground smooth. At points where hardware is attached, $\frac{1}{8}$ in. reinforcing plates are electrically welded in place. Anchors are made of No. 14 gauge steel and arranged to adjust vertically. The angle connections for steel sash on type No. 14SS frames are made of No. 12 gauge steel.

Painting—Frames are painted throughout with one coat of battleship gray paint, thoroughly brushed on.

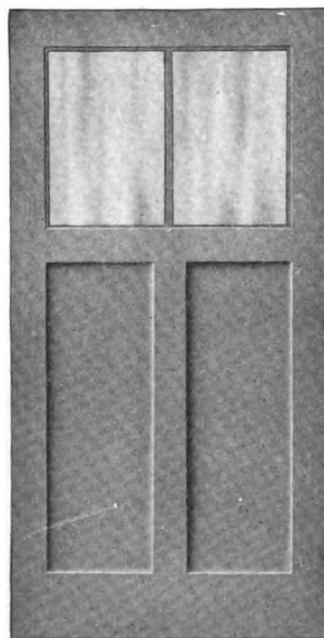
Suggestions for Ordering

In ordering, always specify type of door or frame by symbol. Also furnish sketch showing swing of doors, indicating which side is outside.

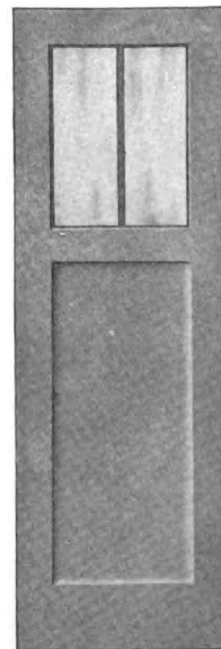
In selecting hardware, whether furnished by door manufacturer or contractor, it is preferable and more economical to use service hardware to facilitate attach-



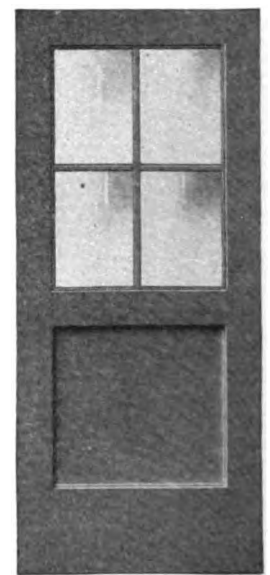
Type 2A
Size 3x7 ft.



Type S2
Size, 4x8 ft.



Type F3
Size, 2 ft. 8 in. x 8 ft.



Type 2B+
Size, 3x7 ft.

TYPES OF NATIONAL STEEL "DURABLE" DOORS CARRIED IN STOCK
Can be used as single, pairs or sliding doors

ing of same and increase salvage or re-use value of doors. Hardware must always be shipped packed with machine screws.

Noteworthy Recent Installations

BUILDING AND LOCATION
Calumet Powerhouse, Chicago, Ill.

Continental Motors Co., Muskegon, Mich.

Delco Light Co., Dayton, Ohio.

Des Moines Hosiery Mills, Des Moines, Iowa.

General Motors Corp., St. Louis, Mo.

National Biscuit Co., Pittsburgh, Pa.

ARCHITECT

F. L. Barrett

The Arnold Co.

Schenk & Williams

Vorse, Kraetsch & Kraetsch

Dupont Engineering Co.

A. G. Zimmermann

BUILDING AND LOCATION

National Cash Register Co., Dayton, Ohio.

Powers Regulator Co., Chicago, Ill.

Van Camp Packing Co., Indianapolis, Ind.

Winchester Arms Co., Chicago, Ill.

Lawrence Ice Cream Co., Chicago, Ill.

Mishawaka Woolen Mills, Mishawaka, Ind.

Cudahy Packing Co., Cudahy, Wis.

American Bottle Co., Newark, Ohio.

ARCHITECT

Frank Hill Smith

Industrial Building Co.

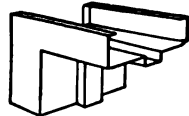
A. G. Zimmermann

Industrial Building Co.

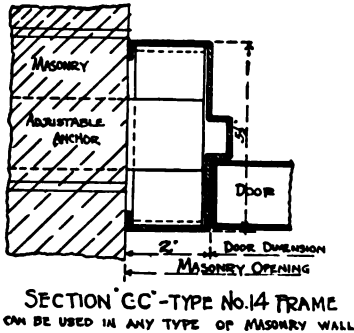
E. S. Weigle

Albert Kahn

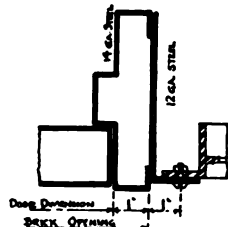
DeVores Engineering Co.



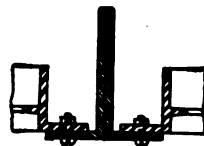
PERSPECTIVE VIEW
OF FRAME NO. 14
SHOWING WELDED CONNECTION
BETWEEN HEAD AND JAMB



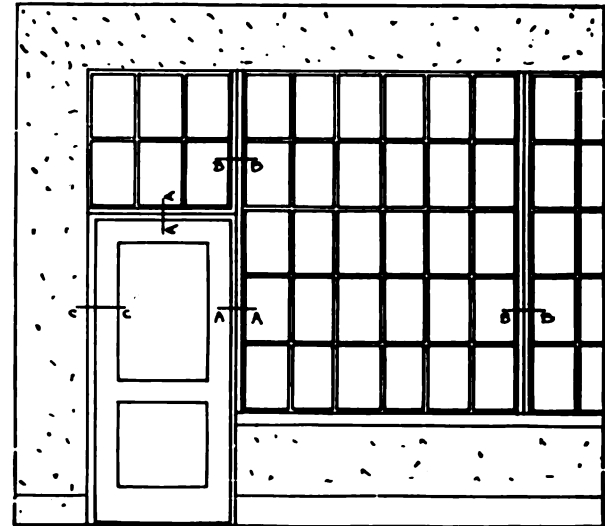
SECTION 'CC'-TYPE NO. 14 FRAME
CAN BE USED IN ANY TYPE OF MASONRY WALL



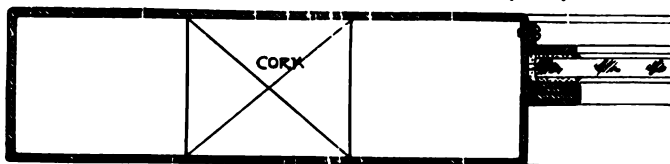
SECTION 'A-A'
SHOWING ANGLE CONNECTION
FOR ATTACHMENT OF STEEL SASH



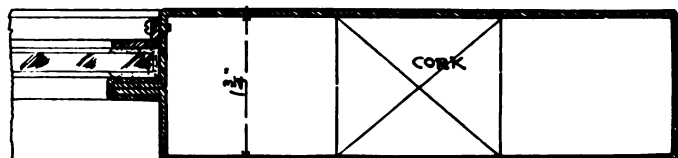
SECTION 'B-B'
DETAIL OF MULLION



ELEVATION OF SASH PARTITION

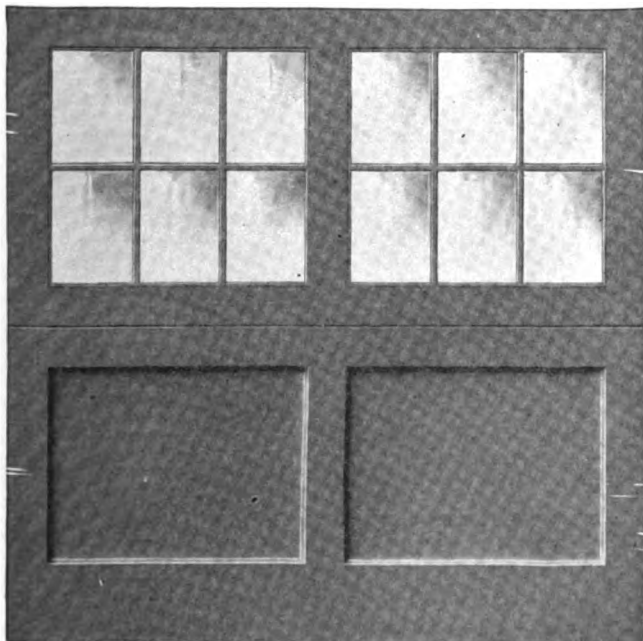


14 GAUGE STEEL

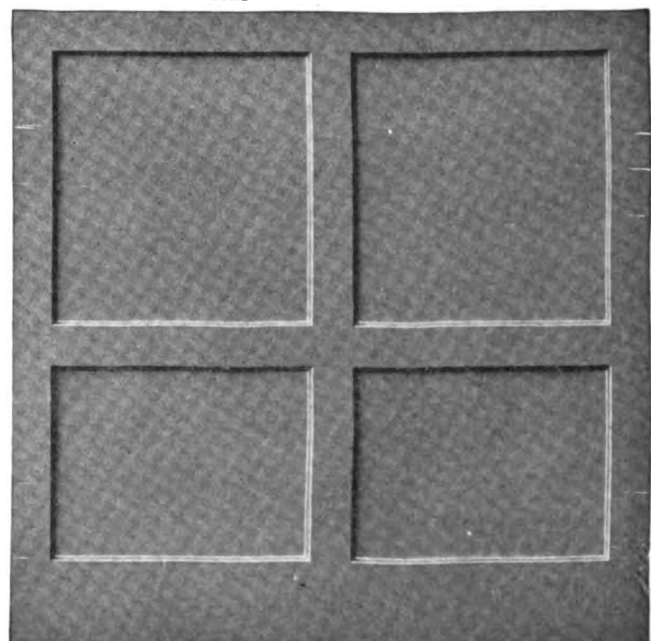


14 GAUGE STEEL

HORIZONTAL SECTION THROUGH DOOR
TYPICAL DETAILS OF "DURABLE" DOORS AND FRAMES



"DURABLE" SLIDING OR VERTICAL LIFT DOORS
In any size or panel arrangement



"DURABLE" JACK-KNIFE COUNTERBALANCED DOORS
In any size or panel arrangement

LYON-CARR FIRE DOOR COMPANY

FORMERLY UNDERWRITERS HATCH DOOR CO.

Manufacturers of Standard Tin-clad Fire Doors

1739-1743 Walnut Street

CHICAGO, ILL.

TELEPHONE
WEST 2703

Products

LION STANDARD TIN-CLAD FIRE DOORS and SHUTTERS; LION STANDARD FIRE DOOR HARDWARE and AUTOMATIC CLOSING DEVICES; APPROVED FUSIBLE LINKS.

Also Lion Standard Meeker Elevator and Compound Slide-up Doors, Lion Standard Kalamein Doors and Frames, Lion Standard Fire Door Frames and Sills.

Types of Fire Doors

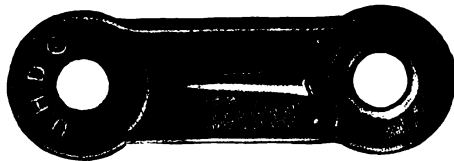
Designed to conform to various conditions, they are of many kinds: Gravity sliding, horizontal or level sliding, vertical or slide-up, and swinging fire doors. Standard wood-core tin-clad fire doors are extensively used for the protection of large and small openings in important fire walls of either old or new buildings.

Official Approval

Lion standard tin-clad fire doors and shutters are approved by the National Board of Fire Underwriters, the New England Mutuals and the Associated Factory Mutuals. They are regularly inspected and labeled under the supervision of the Underwriters' Laboratories, Inc.

Approved Fusible Link

This link is included in the list of fire appliances examined and tested under the requirements of the National Board of Fire Underwriters by the Underwriters' Laboratories at Chicago.

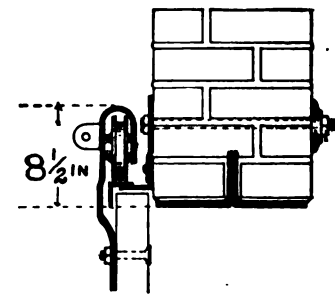
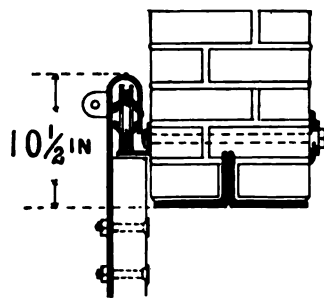
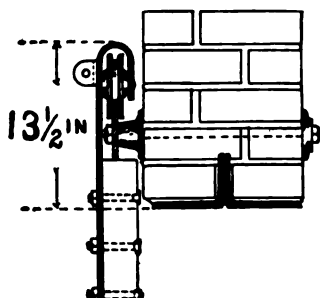


FUSIBLE LINK—FULL SIZE

For use in connection with automatic closing fire doors, windows and other automatic devices requiring fusible links.

Level Sliding Fire Doors

This type of door operates on a level, flat track and is used where headroom is insufficient to place the track on an incline of $\frac{1}{4}$ in. per ft. Two sets of counterweights are used; in case of fire, the fusible link fuses

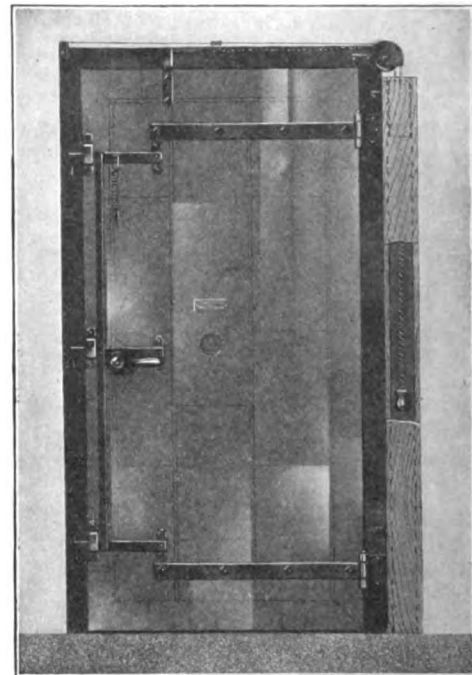


SPECIAL DESIGNS OF LEVEL TRACKS AND HANGERS FOR LIMITED HEADROOM

and allows the back weight to drop and the front weight then pulls the door rapidly across the opening.

Swinging Fire Doors and Shutters

In design, this type can be either single or double swing and hung in either flush or rabbeted angle iron frames; or, by overlapping the wall 4 in., the frames may be omitted. Complete fire door hardware can be furnished with or without the fusible link automatic closing device.



LION STANDARD TIN-CLAD SWINGING FIRE DOOR

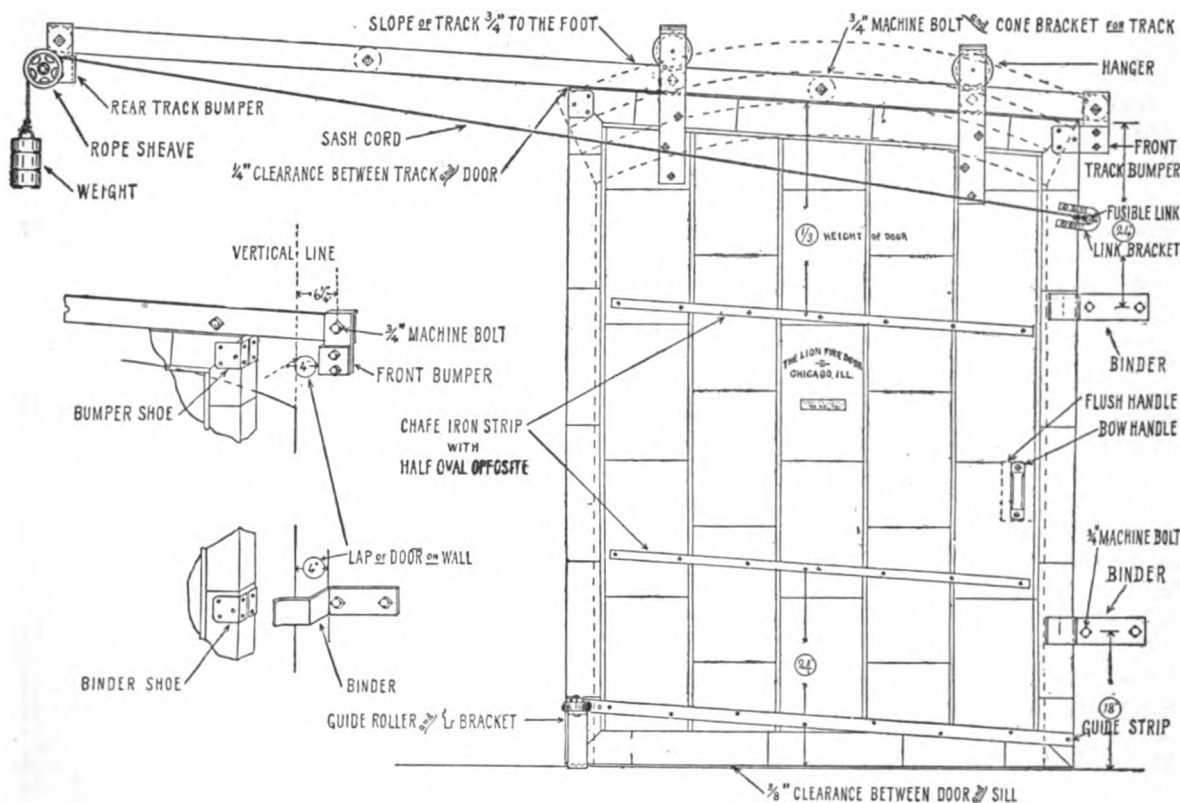
Vertical Slide-up Fire Doors

This type is used where it is impossible to install either horizontal or swinging fire doors. It is counter-balanced by one large and one small weight, which together balance the weight of the door. In case of fire the fusible link fuses, releasing the smaller weight and allowing the door to descend slowly from force of gravity.

Gravity Sliding Fire Doors

This type is particularly adapted for fire wall openings because of its easy operation due to the fact

sign is that the door slides flush with the surface of the wall and does not take up valuable floor space nor do the operating parts obstruct the passage.

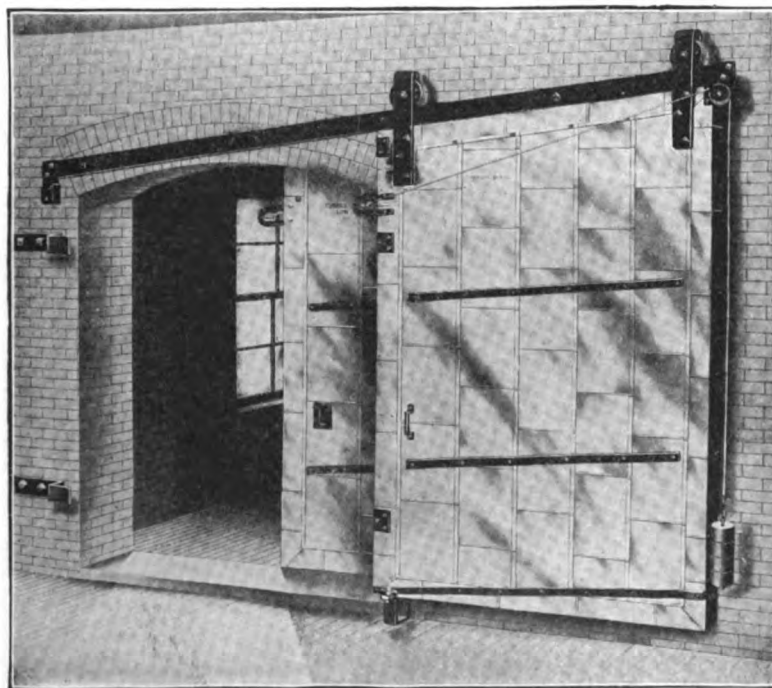


DETAILS OF LION STANDARD TIN-CLAD GRAVITY FIRE DOOR

that the door hangs on a flat steel track, inclined $\frac{3}{4}$ in. per ft. The door is counterbalanced, the weight relieving the force of gravity. In case of fire, the fusible link exposed in the opening fuses, the weight is released and the door rapidly closes, thereby preventing the flames from spreading to the adjoining portion of the building. Another important feature of this de-

Split Gravity Fire Doors

This type is designed to meet special conditions such as insufficient wall space on either side of opening to permit the door to slide clear of jamb, or if overhead carrier system track passes through opening. A double set of fire door hardware is required. This type of door can also be furnished to operate on a level, flat track.



LION STANDARD TIN-CLAD GRAVITY FIRE DOOR

Special Fire Door Work

We make a specialty of fire door work and are prepared to build non-labeled kalamein doors and frames, meeker elevator and compound slide-up doors, either tin-clad or of corrugated iron, also the steel type of construction for both swinging and sliding fire doors. Special fire door hardware and fixtures designed and manufactured.

Facilities and Workmanship

We are prepared to handle any size order for tin-clad doors and assure customers prompt deliveries.

In the manufacture of our products we have not overlooked essential features, such as utility and design. Lion fire doors and equipment are built of the best in material and workmanship, combining sturdy construction, rugged strength and promise of long service.

Catalogue

Our latest catalogue, containing complete descriptions and illustrations of Lion fire doors and hardware with detailed instructions for installation, will be furnished on request.

THE PELLE COMPANY

Manufacturers of Elevator and Warehouse Fireproof Doors

TELEPHONE

STAGG 365, 366, 367

Stewart and Flushing Avenues

BROOKLYN, N. Y.

BRANCHES

BOSTON, 18 Tremont Street—Telephone, Fort Hill 747

CLEVELAND, Caxton Building—Telephone, Maine 4053

CHICAGO, 200 North Jefferson Street—Telephone, Wabash 2020

AGENCIES IN ALL PROMINENT CITIES IN THE UNITED STATES AND CANADA

For Nearest Agency communicate with Main Office

Product

PEELLE COUNTERBALANCED TRUCKABLE FIREPROOF ELEVATOR DOORS.

Services

THE PELLE COMPANY engineers are prepared to assist clients in selecting the proper and most economical equipment to suit special conditions and requirements.

Peelle Counterbalanced Truckable Door (Patented)

Underwriters' Approval—This door, as constructed exclusively by this company, is manufactured under the direct supervision of the Underwriters' Laboratories, Inc., and bears their label. It is also approved and highly recommended by local Building Departments and State Labor Bureaus throughout the country.

Doors exceeding 8 ft. in width or 10 ft. in height, can, in no case, bear the underwriters' label, but can be made according to label specification.

Construction and Specification Data—Peelle counterbalanced doors open vertically at the center and as each section is required to travel only half the height of the door, full and clear opening is obtained instantly. The two halves balance one another and are connected by heavy flexible chains running over double radial ball bearings pulleys, making the operation very easy.

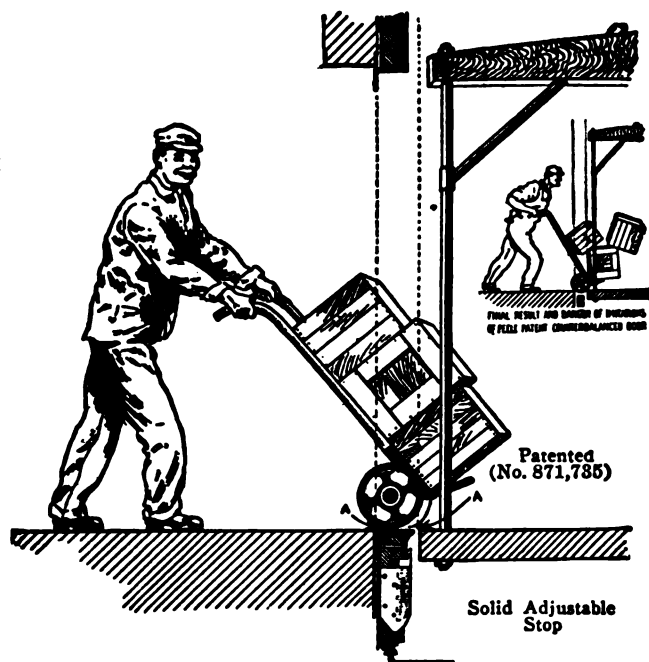
The panels are made of two thicknesses of white pine covered with the best grade I. C.terne tin, set and bolted into angle iron frames with reinforced corners. This is the standard form of panel construction unless the floor heights are too low or when a kalamein or all-metal panel is desired.

The upper edge of the lower panel is reinforced so that when the Peelle door is open, it provides a solid sill between the building floor and the elevator car (see illustration).

Hanger bar at upper surface of lower panel on all Peelle counterbalanced doors is reinforced and extends beyond panel frame, to rest on solid adjustable stops riveted to wall rails. This removes all weight from turnbuckles and chains when door is open and in use. Hanger bar which forms the trucking sill can be made to carry any specified load.

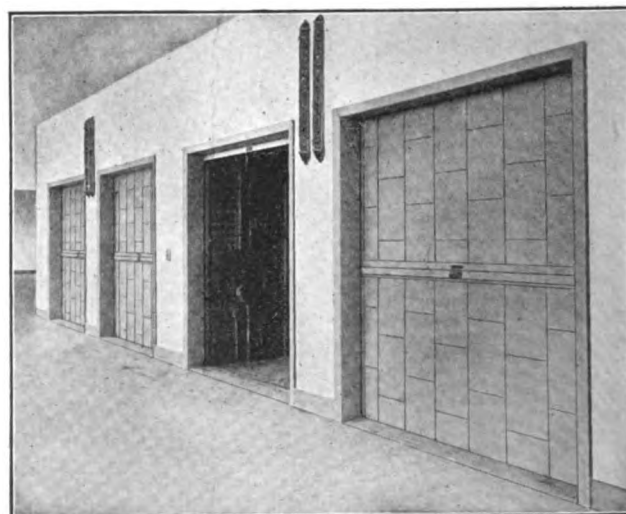
Running chains are not used in the support of Peelle doors, when open. The Peelle patented truckable feature has been infringed, and users should beware of imitations.

Any of the Peelle safety appliances or electrical equipment can be furnished with this door.



PEELLE TRUCKABLE ELEVATOR DOOR

Note special adjustable stop which firmly binds door, when open, to building sill. This is the only counterbalance door that fills gap between car and building floor firmly and perfectly flush with building sill. Peelle corrugated steel elevator door has additional similar binding and supporting devices at center or at more frequent intervals, according to size of door and amount of trucking it is to be subjected to.



STANDARD TIN COVERED PELLE COUNTERBALANCED DOORS

Peelle Electric Interlock

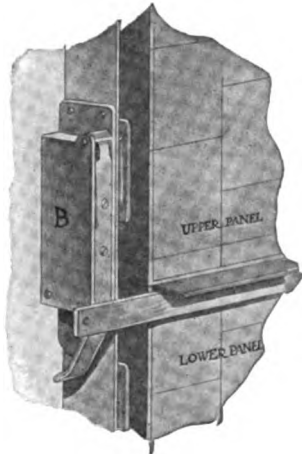
The position of the interlock on the rails of the Peelle counterbalance door is shown here. The mechanism is entirely enclosed and protected from dirt and dust.

Doors equipped with electric interlocks are manually operated. The function of the interlock is to render the car inoperative unless all doors are first closed and locked.

An emergency switch in glass covered box can be installed in the elevator car, to operate the car with doors open in case of fire or other emergency.

Elevator cars not having a full magnetic control are equipped with the Peelle mechanical interlock, making it possible to interlock any type or make of car.

Peelle interlocks are approved by all State Departments and other boards having jurisdiction.



PEELLE ELECTRIC INTERLOCK

MINIMUM FLOOR HEIGHTS FOR PEELLE DOORS

Height of opening ft.	Finished floor to in.	Height of opening ft.	Finished floor to in.	Height of opening ft.	Finished floor to in.	Height of opening ft.	Finished floor to in.
5	9	9	5½	7	6	12	1
6	0	9	10	7	9	12	5½
6	3	10	2½	8	0	12	10
6	6	10	7	8	3	13	2½
6	9	10	11	8	6	13	7
7	0	11	4	8	9	13	11½
7	3	11	8½	9	0	14	8½

Above table is for labeled doors. Deduct 4 in. for unlabeled. Pass type doors can be used where floor heights are too low.

Shaft Construction Data

Channel jambs should be provided.

Hollow tile or other light wall construction should

have channel jambs from floor to ceiling. All sills, jambs and lintels to be built flush and plumb.

Openings must be built in vertical alignment.

Jambs, sills, stationary lintels or trim not furnished by THE PEELLE COMPANY.

Peelle Pass Type Construction

Where high door openings are required in a building where the story heights are relatively low, the regular type of Peelle doors can not be used.

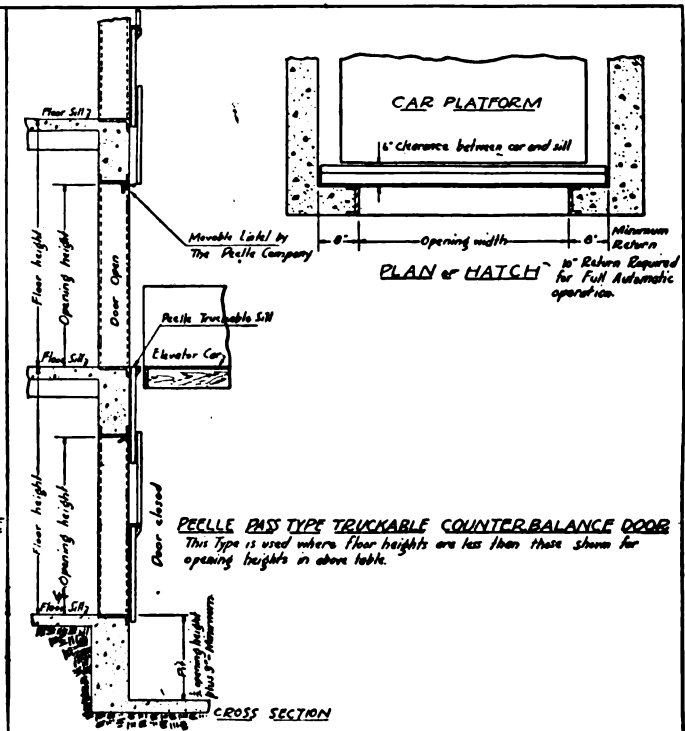
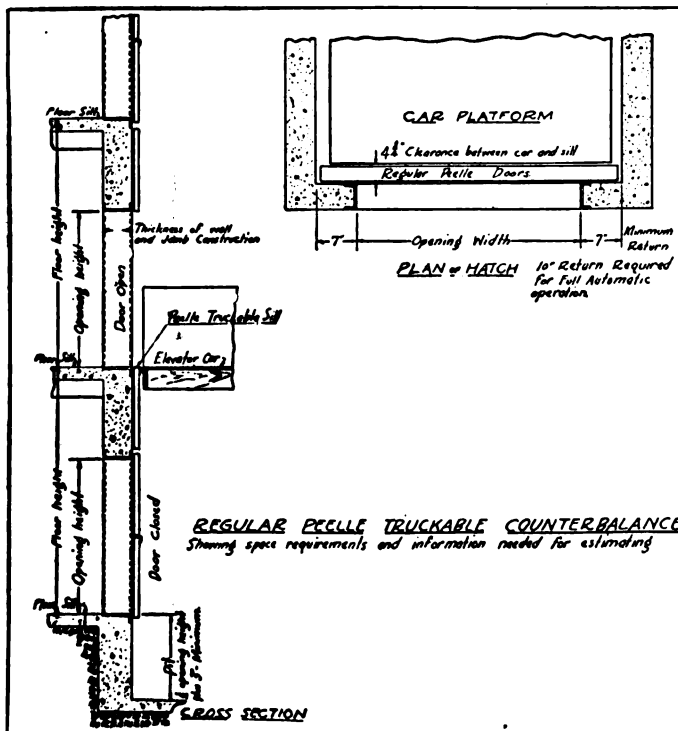
Peelle pass type counterbalanced elevator doors are admirably suited for this purpose and are a most effective solution for fire and general safety problems in connection with warehouse and garage elevator openings.

Peelle pass type counterbalanced doors can be installed wherever openings are separated 16 in. or more without special construction, and are usually labeled by the Factory Mutual Companies only. In special instances, however, our special Peelle self-binding door can be furnished bearing Underwriters' Laboratories label. The doors can be furnished with either wood tin clad or corrugated iron panels. Wood tin clad panels are much superior and always recommended.

The operation of these doors is the same as that of the regular Peelle counterbalanced truckable doors and the same high grade materials and workmanship are used throughout.

The panels are not mounted one directly above the other, but are staggered and run on separate guides. The upper panel is thus enabled to pass by the lower panel of the door on the floor above, the lower panel likewise lapping the upper panel of the door on the floor below. The gap formed at the lintel is effectually closed by a movable lintel which is so constructed as to allow the lower panel of the door above to pass as required.

Peelle pass type counterbalanced elevator doors have been installed in thousands of warehouses and garages in this country and Canada, are in constant use under heavy traffic and are giving utmost satisfaction.



PLANS AND CROSS SECTIONS OF TWO TYPES OF PEELLE COUNTERBALANCED TRUCKABLE DOORS

RICHMOND SAFETY GATE CO.

Manufacturers of Fire Doors and Shutters

MAIN OFFICE AND FACTORY

RICHMOND, IND.

For nearest Agency communicate with Main Office

Products

HORIZONTAL FOLDING DOORS; STANDARD TIN CLAD FIRE DOORS and SHUTTERS; COUNTERBALANCED ELEVATOR DOORS.

Installation of Richmond Products

Our products are sold either f.o.b. Richmond, Ind., or installed complete. In the first case, if desired, we can supply a competent foreman at a minimum rate, to superintend the installation. In the second case, a contract may be executed to cover the delivery and complete installation of the products.

Fire doors are sold with or without fixtures.

Canopy Folding Doors

Suitable for factories, warehouses, garages, etc. May be installed inside or outside of opening (forming a

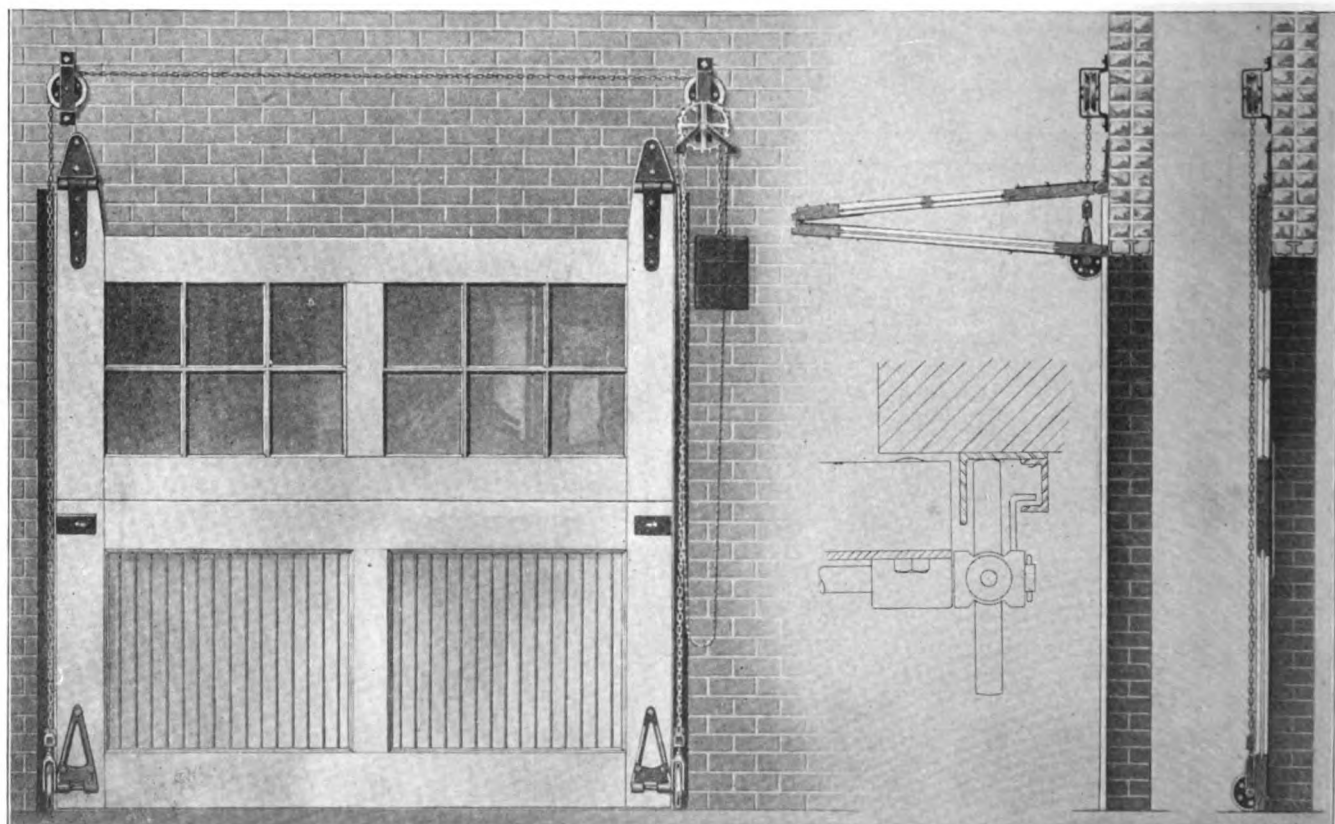
canopy over opening). Operated by means of chain hoist and counterweights.

Standard Tin Clad Fire Doors and Fixtures

Underwriters' Approval—Richmond fire doors and fixtures are made in strict accordance with the latest rules and requirements of insurance authorities. Several types of doors and fixtures are labeled under the supervision of the Underwriters' Laboratories, Inc., and are sold with the guarantee that they will be fully approved by local and state inspection bureaus.

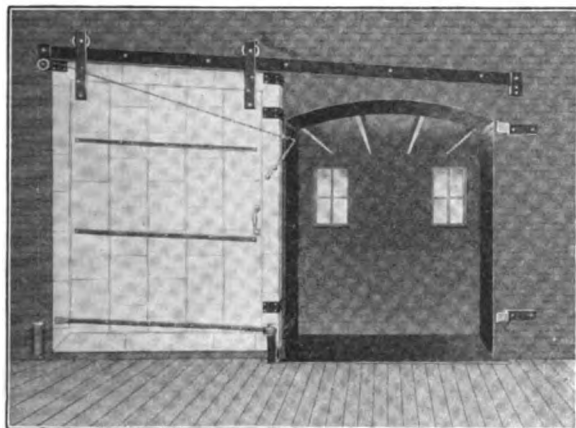
Every National standard fire door and fire shutter made by us is constructed in accordance with the rules and requirements of the National Board of Fire Underwriters and inspected and labeled under the supervision of the Underwriters' Laboratories, Inc.

A finished door measures $2\frac{5}{8}$ in., including tin, and a finished shutter $1\frac{3}{4}$ in.; 4 in. is considered standard lap each side of the opening.



RICHMOND CANOPY FOLDING DOOR, ENDLESS CHAIN TYPE

Sliding Doors and Fixtures—The type illustrated below is in many respects the simplest, yet the most reliable on the market. The door is counterbalanced and held in any desired position. The automatic closing device may be modified to comply with local insurance requirements. Doors and hardware are regularly inspected and labeled under the direction of the Underwriters' Laboratories, Inc.



No. 200. SLIDING DOOR AND FIXTURES

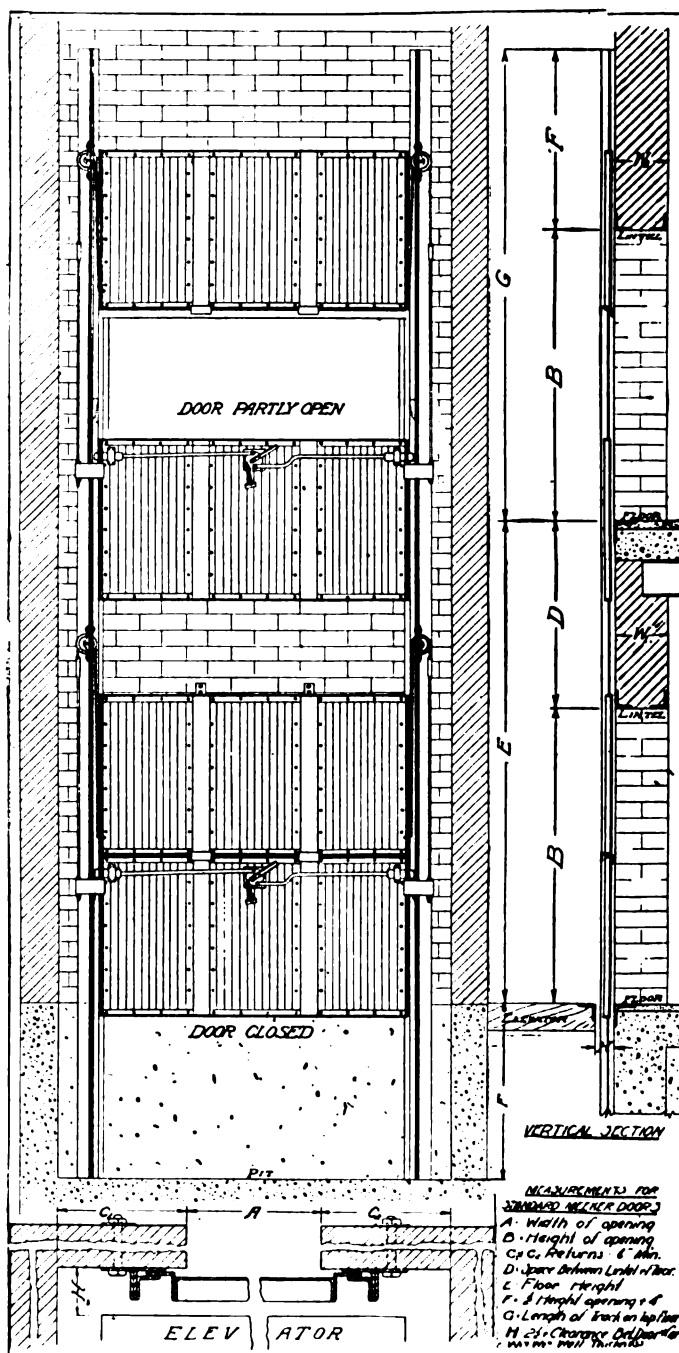
Counterbalanced Elevator Doors

Richmond counterbalanced doors are mounted on the inside of the elevator shaft, and are made in two sections divided in the center. The guides are of angles bolted to wall. The door sections are of corrugated iron surrounded by and riveted to angle frames. The two door sections are connected by means of heavy cable chain and rods. The chain travels over roller bearing sheaves riveted to the guide angles.

Counterbalanced doors are designed for manual operation from the car, but when desired a self-closing attachment is provided.

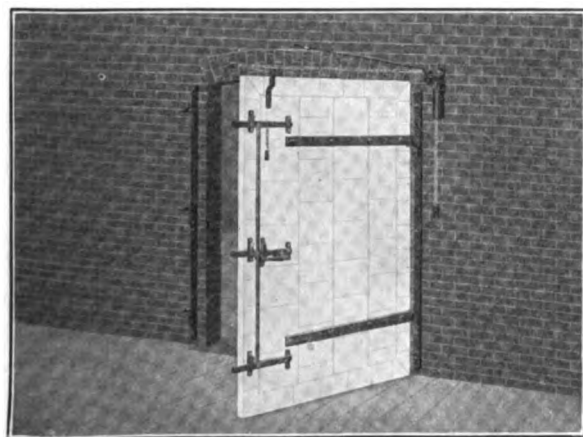
Richmond counterbalanced doors are inspected and labeled under the direction of the Underwriters' Laboratories, Inc.

Detail blue prints on request.



DETAILS OF COUNTERBALANCED ELEVATOR DOOR

Swing Doors and Fixtures—Recommended when sliding doors can not be used. Automatic closing attachment should be used on all doors used frequently; device shown below is positive in action and thoroughly reliable. Doors and hardware are regularly inspected under direction of the Underwriters' Laboratories, Inc.



No. 120. SINGLE SWING DOOR AND FIXTURES

Other Types—The several types of standard fire doors commonly furnished include single and double slide, single and double swing, vertical slide, etc.

Special Conditions—Doors, fixtures and operating devices can always be arranged or supplied to meet unusual conditions. The conditions shown in this company's catalogues are desirable but not necessarily invariable. The engineering department is available to those who have fire door problems to solve.

Standard Fire Shutters

Constructed the same as standard fire doors but are 2-ply. They are made to swing or slide and are specially constructed when necessary.

PENN METAL COMPANY

Manufacturers of Fireproof Doors and Windows

65 Franklin Street
BOSTON, MASS.

SALES OFFICES

PHILADELPHIA, PA., 25th and Wharton Streets
HARTFORD, CONN., 28 Owen Street

PORTLAND, ME., 95 Exchange Street
JERSEY CITY, N. J., corner of First and Washington Streets

Products

PENCO METAL COVERED KALAMEIN DOORS, FRAMES and TRIM; TIN CLAD FIRE DOORS and SHUTTERS; STANDARD ROLLED STEEL BUCK, FRAME and TRIM UNITS.

Also manufacturers of Metal Lath, Corner Beads, Studding, Ceilings and Roofing; Machine Guard Mesh; Tanks; Concrete Reinforcement; Metal Specialties.

For Steel Shelving and Lockers, see page 921.

Penco Metal Covered Doors, Frames and Trim

Penco metal covered doors are made by drawing sheet metal through steel dies over a wood core of clear white pine.

The drawing process practically welds the metal covering to its core, eliminating all buckles and bringing out all mouldings and members in clear relief.

The doors are made in sections, mortised, tenoned and bolted together.

Stock sizes (door size): 2 ft. 8 in. x 6 ft. 8 in., 2 ft. 10 in. x 7 ft., 3 ft. x 7 ft.

All kalamein doors finished with priming coat of gray paint.

Immediate Shipment—Standard sizes and styles in kalamein iron, as illustrated, are carried in stock for immediate shipment.



Special styles and sizes furnished on short notice. Made in kalamein iron, copper and low brass.

Penco Tin Clad Fire Doors and Shutters

Penco tin clad fire doors and shutters are made in any style and size to meet either standard or unusual and special conditions.

Doors are furnished with or without hardware, either f.o.b. cars Boston, or installed complete at the option of the purchaser.

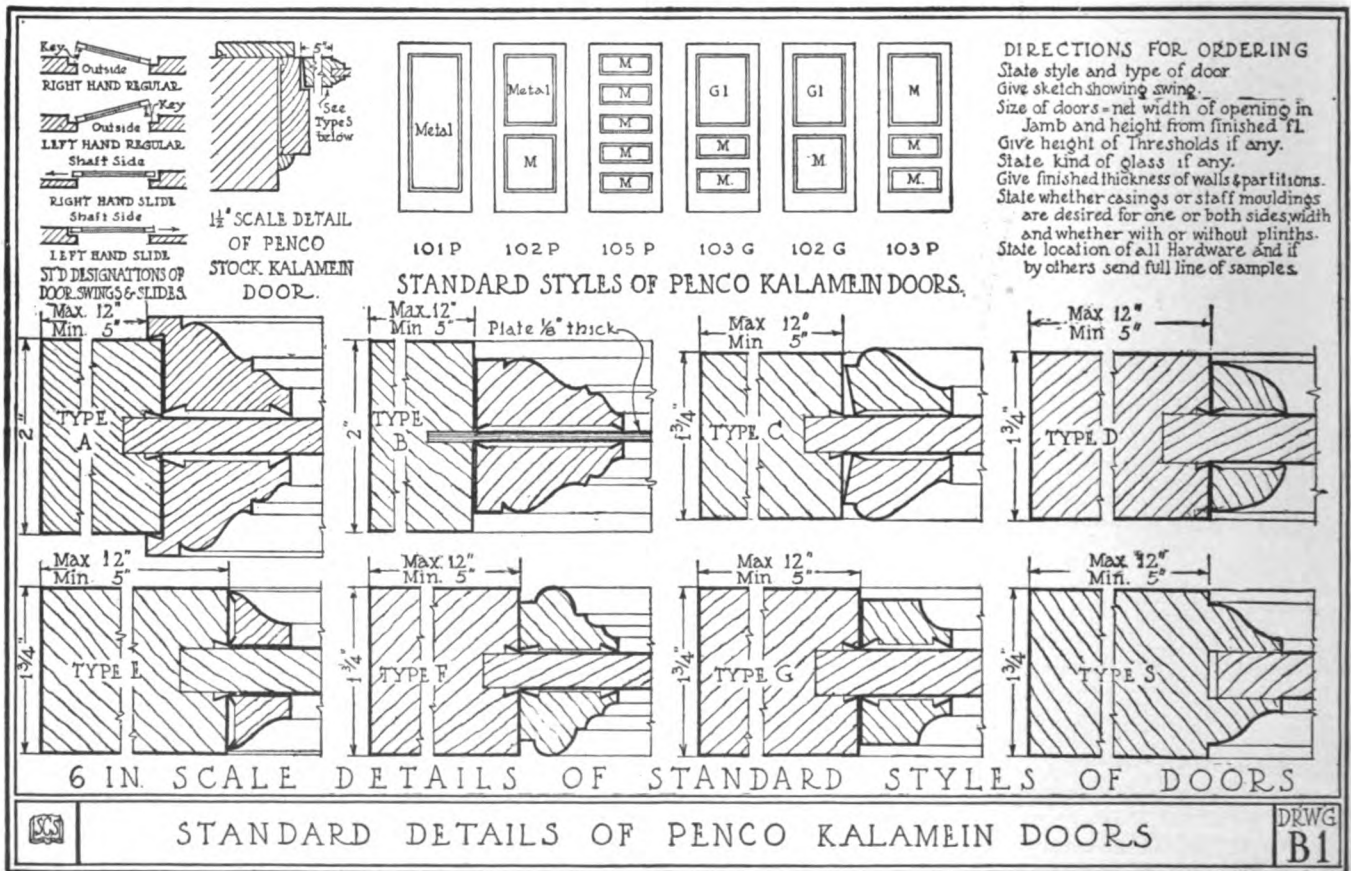
Penco Standard Rolled Steel Buck, Frame and Trim Units

These door frames and trim units are made of heavy sections, formed from cold rolled sheet steel. The weight of the metal used varies from No. 12 to No. 18 gauge, according to the conditions to be met.

The miters are process welded. Anchor plates, welded to the frame, are provided to extend into the masonry joints, thus providing a perfectly rigid integral combination of buck frame and trim.

Made in variable sizes to meet practically any condition.

Finished with priming coat of gray paint before leaving factory.



SECURITY FIRE DOOR CO.

Manufacturers of Freight Elevator and Warehouse Fireproof Doors

815-817 South 14th Street

ST. LOUIS, MO.

AGENCIES IN PRINCIPAL CITIES

Products

"SEC-TEL" CORRUGATED and KALAMEIN TWO-SECTION SLIDE-UP FREIGHT ELEVATOR DOOR.

"SECO" CORRUGATED, TIN CLAD and KALAMEIN COUNTERBALANCED FREIGHT ELEVATOR DOOR.

"HORIFOLD" WAREHOUSE, FREIGHT HOUSE, SHIPPING PLATFORM and GARAGE DOOR.

Also Underwriters' Labeled Tin Clad Sliding and Swinging Fire Doors.

Underwriters' Approval

All "Sec-Tel" and "Seco" freight Elevator doors are inspected and labeled by the Underwriters' Laboratories, Inc.

"Sec-Tel" Door

The "Sec-Tel" door is a two-section slide-up or vertical telescoping elevator door. "Sec-Tel" doors permit the use of permanent building sill for trucking over on to the elevator car.

The "Sec-Tel" door is a combination fire door and safety gate, as no safety gate is required when the "Sec-Tel" door is used.

The use of "Sec-Tel" doors reduces fire and accident insurance.

Roller bearing sheaves and special anti-friction door guides assure ease of operation.



"SEC-TEL" DOOR

"Seco" Door

The "Seco" door is a counterbalanced, freight elevator door, with either corrugated, tin clad or kalamein sections.

"Seco" doors are equipped with heavy steel trucking bars on top of the lower half, and with special trucking bar supports to take the load off the guides and chains when door is open for trucking over.

The *tee trucking bar* on our corrugated "Seco" door is the acme of perfection.

"Seco" doors are constructed to prevent deflection into shaft from trucks passing over same.



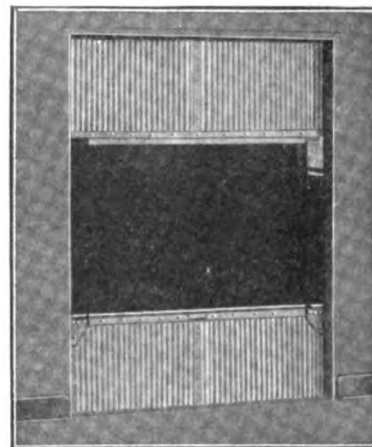
TRADE-MARK

All "Seco" doors are provided with self-aligning sill stops.

Pass Type "Seco" Door—For low story heights, the Underwriters, in many cases, permit the use of pass type doors, which can be furnished for openings only 18 in. less in height than the story height.

Safety Devices

We recommend for use with our "Sec-Tel" and "Seco" doors, our safety electric interlocking switches which prevent the operation of the elevator car until all doors in shaft are closed. We also can furnish semi-automatic devices for small doors.



"SECO" DOOR

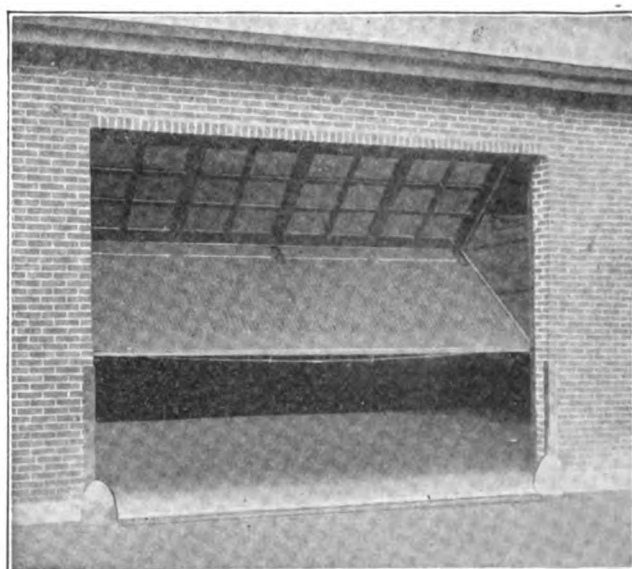
Corrugated counterbalanced type

"Horifold" Door

The "Horifold" door is a horizontal folding door and can be made of wood, corrugated steel, tin clad, or paneled wood metal covered sections.

"Horifold" doors are specially adapted for shipping platforms of warehouses, factory buildings, freight houses and garages.

Can be arranged for glass in upper half, also with a wicket door in lower section.



"HORIFOLD" DOOR PARTLY OPEN

Service

Let us help solve your door problems. Write for detail drawings and further data.

CORNELL IRON WORKS

Manufacturers of Steel Rolling Doors and Shutters

TELEPHONES

CHELSEA 1423, 1424, 0550

26th Street and Eleventh Avenue

NEW YORK, N. Y.

REPRESENTATIVES IN THE PRINCIPAL CITIES

Products

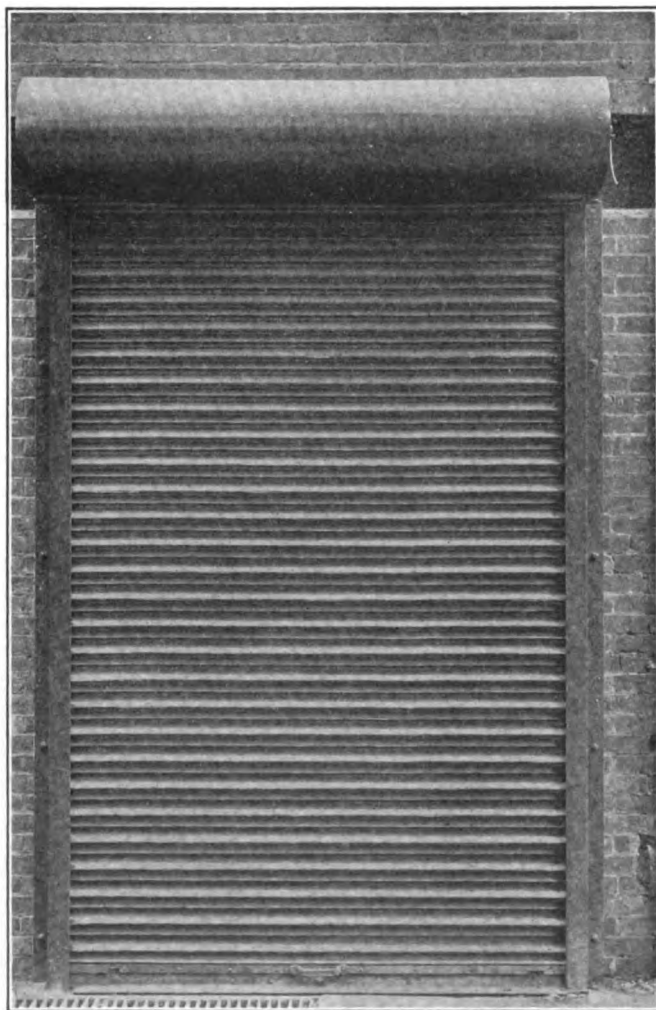
CORNELL IMPROVED INTERLOCKING SLAT and DEEP CORRUGATED TYPES of STEEL ROLLING DOORS and SHUTTERS, hand, chain, or motor operated, for residences, office buildings, garages, wharves and piers, warehouses, elevator shafts, store fronts, craneway openings, etc.

Oldest Rolling Door Concern

The CORNELL IRON WORKS is the oldest rolling door manufacturer in the United States. Cornell doors have been in use for 50 years and more. See our catalogue.

Steel Rolling Doors for all Openings

Cornell steel rolling doors are designed for the closure of all types of openings. They offer fire and burglar protection, combined with neat appearance and economy of space.



CORNELL IMPROVED INTERLOCKING STEEL SLAT DOOR

The curtains slide in vertical side guides and coil around a horizontal shaft above the opening.

The weight of the curtain is counterbalanced by springs in or on the shaft, which permit it to remain stationary in any position.

Methods of Operation

There are four typical methods of operation:

Self-coiling Type—Standard for openings up to 8x10 ft. Push up and pull down by handles on the bottom bar. The quickest acting construction possible.

Hand Chain and Gearing Type—Standard for larger openings. Shaft revolved by endless hand chain acting through single or compound gearing on an overhead gear bracket.

Motor Drive Type—Standard for the largest openings up to 40 ft. in width.

Automatic Closing Type—Controlled by fusible link melting at 150° Fahr.

Special Cases—Worm and bevel gear drives, operating from either side of openings with hand crank or chain, are provided for special cases.

Cornell Improved Interlocking Steel Slat Curtains

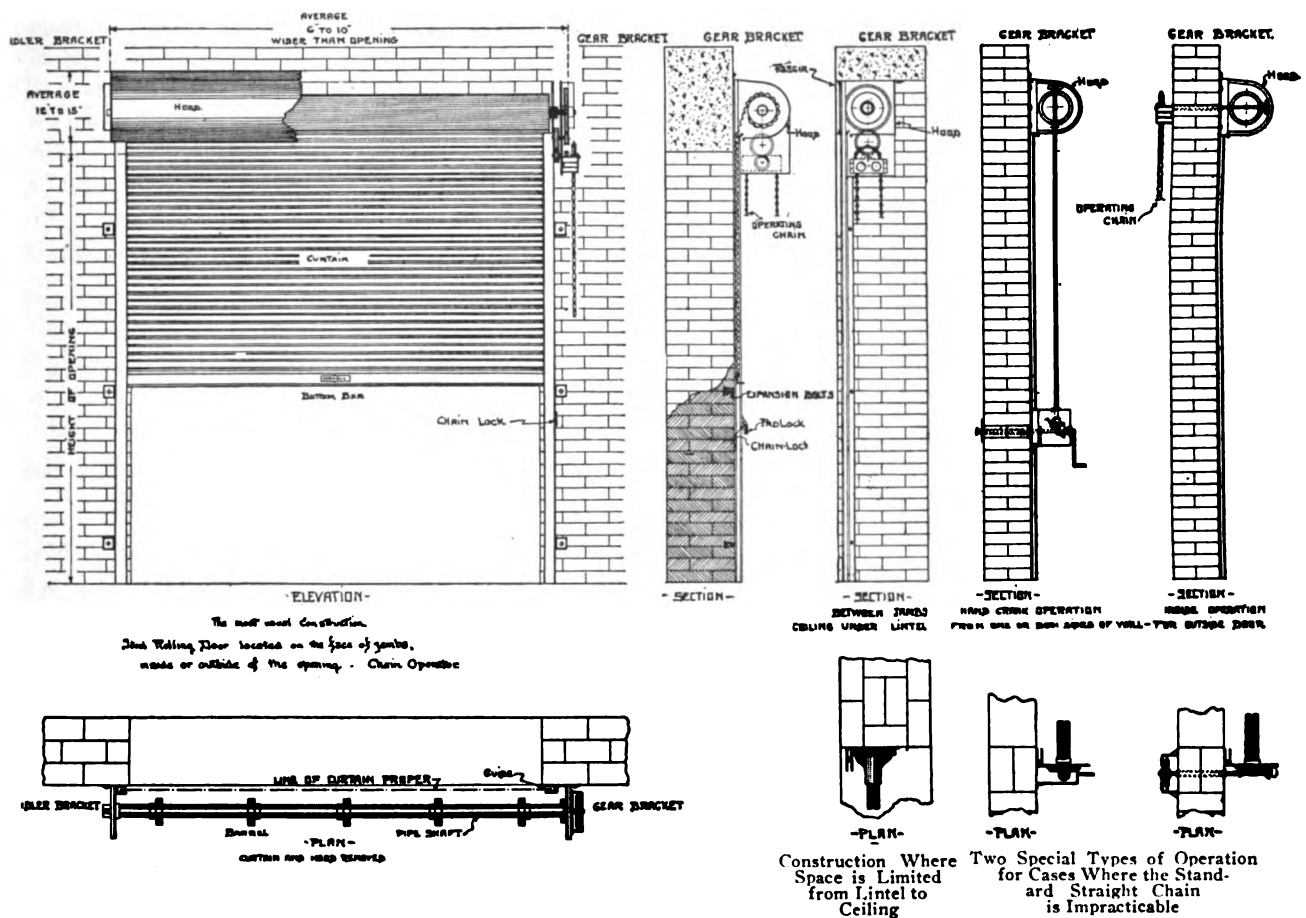
Designed to give unusual rigidity against wind pressure, having a depth at the crown of $\frac{7}{8}$ in. The appearance is attractive from either side, as the curtain is made up of a series of cold rolled steel mouldings with deep relief.

The joint of the slat is so designed that there is practically no lost motion, which means that the curtain will not bulge, and a self-coiling or push-up door will operate without objectionable play between each slat.

The end locks are made of malleable iron, designed for maximum wear and strength.

Furnished in gauges from No. 16 to No. 22, cold rolled and galvanized.



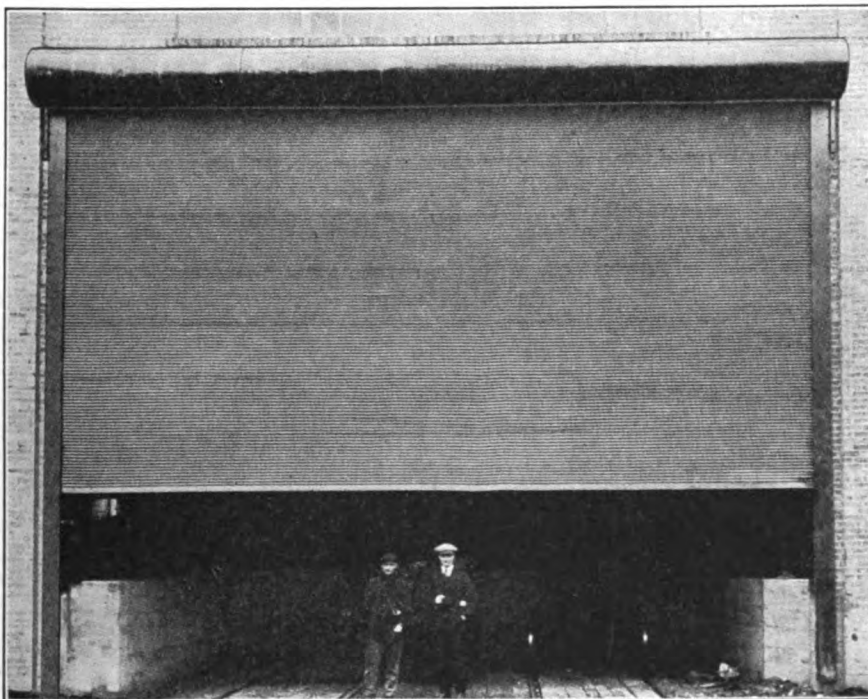


DETAILS OF CONSTRUCTION OF CORNELL ROLLING STEEL DOORS

Cornell Deep Corrugated Steel Curtains

A continuous sheet of deeply corrugated, special shaped, galvanized, resilient steel. The edges are protected by malleable iron shields which take up any wear in the side guides. Easily repaired when injured. Not

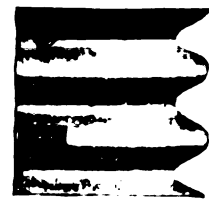
difficult to erect. Will last a lifetime if properly cared for. More economical than slat curtains. Lighter, since no extra metal is needed to make joints. A widely used type and very successful when manufactured by an experienced and skilled organization.



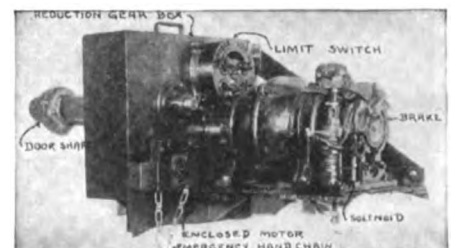
CORNELL DEEP CORRUGATED MOTOR DRIVEN DOOR AT FORT WAYNE, IND.
29 ft. wide by 25 ft. high

Catalogue

Catalogue sent free to any one whose letterhead or position would indicate a legitimate use.



VIEW OF DEEP CORRUGATED CURTAIN



FULLY ENCLOSED MOTOR DRIVE, BUILT FOR
CITY OF BALTIMORE, MD.

All gears enclosed and running in oil. Four remote push button controls

THE KINNEAR MANUFACTURING CO.

Steel and Wood Rolling Doors, Shutters and Partitions

880-890 Field Avenue
COLUMBUS, OHIO

BRANCH OFFICES

NEW YORK, N. Y., 1182 Broadway
WASHINGTON, D. C., 929 Southern Building
BOSTON, MASS., 294 Washington Street
PHILADELPHIA, PA., 503 Wesley Building

CHICAGO, ILL., 1860 C. & C. Bank Building
DETROIT, MICH., 709 Ford Building
CLEVELAND, OHIO, 409 Union Building
KANSAS CITY, MO., 503 Railway Exchange Building

AGENTS IN ALL PRINCIPAL CITIES

Products

STEEL ROLLING DOORS and SHUTTERS;
BIFOLDING DOORS, WOOD or STEEL; WOOD
ROLLING DOORS for roundhouses; VERTICAL
SLIDING DOORS; WOOD ROLLING INTERIOR
PARTITIONS.



(6) Can be mounted either on face of wall or in opening.

(7) Can be operated manually, mechanically or electrically, according to size and requirement. If electrically, either by switches or push button control.

Kinnear Steel Rolling Doors and Shutters

Kinnear steel rolling doors and shutters should recommend themselves to engineers and owners for the following reasons:

(1) They are constructed entirely of steel and therefore fireproof and burglarproof.

(2) They are mounted above the opening entirely out of the way and afford economy of space.

(3) Entirely counterbalanced and provided with suitable bearings, they are easy to operate.

(4) Constructed of interchangeable parts which can be quickly replaced in case of accidental damage, the expense of maintenance is negligible.

(5) For fire purposes labeled doors are positive in closing automatically, can be re-set without difficulty and, as fire stops, have a long record of successes unknown to any other type.

Bifolding Doors—Wood and Steel

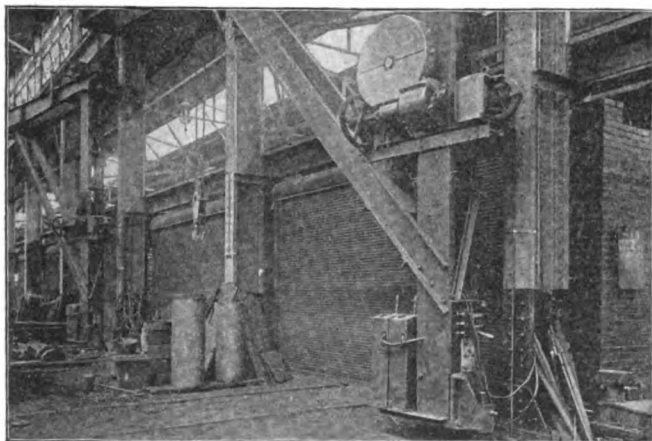
Kinnear bifolding doors are made either of wood or steel. They are particularly desirable for openings in buildings, such as piers and warehouses, where the sources of light are limited, as the upper panel may be constructed to carry sash and glass to the extent of approximately one-third of the entire opening.

When in a closed position these doors are entirely out of the way and when in an open position they are suspended overhead either upon a steel track or heavy steel link. Therefore, practically the entire floor space is available with this type of door.

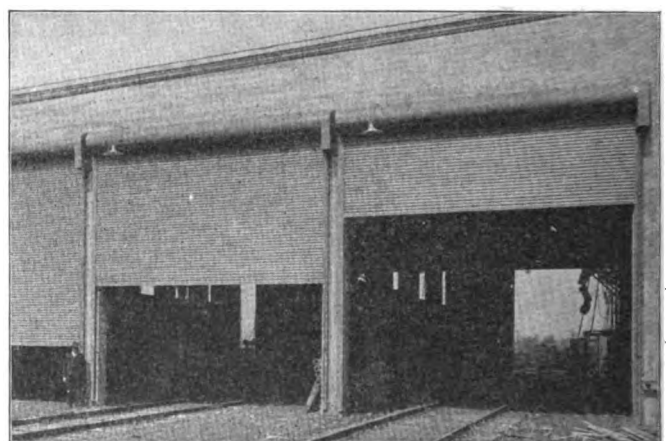
Panels are counterweighted and operated by means of reduction gearing and endless chain.

Vertical Sliding Doors

Kinnear vertical sliding doors are built of steel in



Pennsylvania R.R. Steel Foundry, Altoona, Pa.



Pennsylvania Grain Elevator, Girard Point

INSTALLATIONS OF KINNEAR STEEL ROLLING DOORS

two or more sections, consisting of trussed frame covered with corrugated steel.

Each section is counterweighted and door is operated by means of reduction gearing and endless chain.

Sash for carrying glass can be provided in the upper section if desired.

Wood Rolling Doors

Kinnear wood rolling doors were designed for use in roundhouses, or other buildings where doors are subjected to such influences as would deteriorate the steel rolling doors. Slats are constructed of cypress and treated with creosote. These doors are mounted and operated in manner similar to steel rolling doors, being entirely out of the way, easy to operate, and cheap to maintain.

Interior Partitions

Kinnear interior partitions are constructed with wooden slats. The coil is concealed in box under lintel, being entirely out of sight and out of the way when open. Slats can be supplied to suit other trim in building. This type of partition is particularly suitable for churches, schools and wardrobes in schools, being neat in appearance and easy to operate. The curtain proper is counterbalanced by means of helical springs. Slats

are held in position by phosphor bronze tape, passing through same at frequent intervals. Openings in slats are so shaped that during flexure there is no change in relative length of slats or ribbon, nor is there any danger of pinching the bronze ribbon.

Comprehensiveness of the Kinnear Line

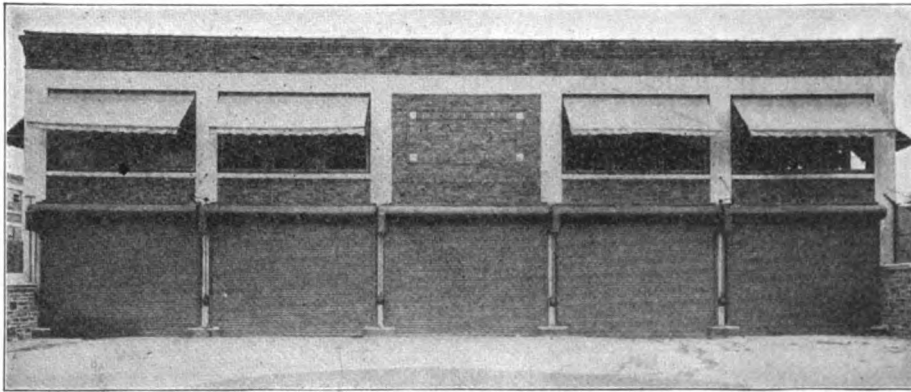
Kinnear products embrace a line of doors and shutters comprehensive enough to meet the most exacting requirements of any class of architecture. They include all the improvements known to the industry which are distinctly *Kinnear*.

Kinnear products may be classified as service doors and shutters and labeled doors and shutters.

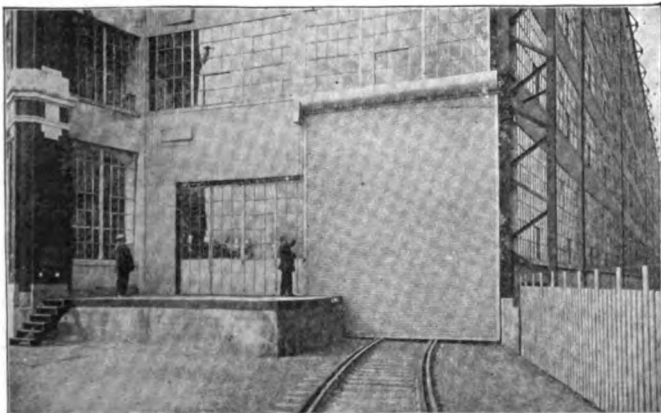
Service Doors

Service doors are supplied for openings where underwriters' requirements are not a consideration and can be supplied for manual, mechanical or motor operation. Kinnear doors are suitable for openings either large or small and especially for large railroad openings, crane openings, piers, warehouses, or even in buildings of classic design.

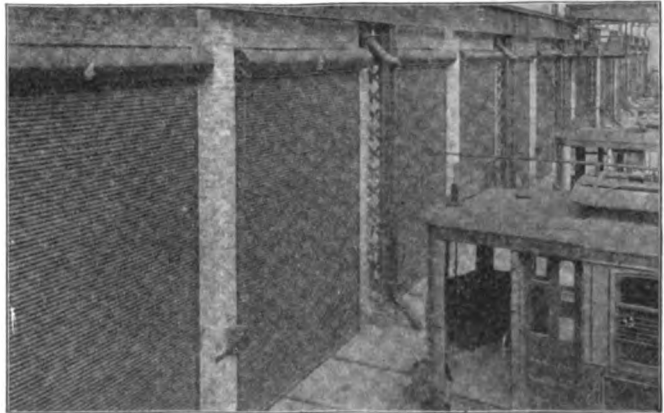
All Kinnear products are built to order to suit each peculiar requirement and assure the highest type of installation.



TYPICAL INSTALLATION OF KINNENAR STEEL ROLLING DOORS IN TRANSFORMER STATION



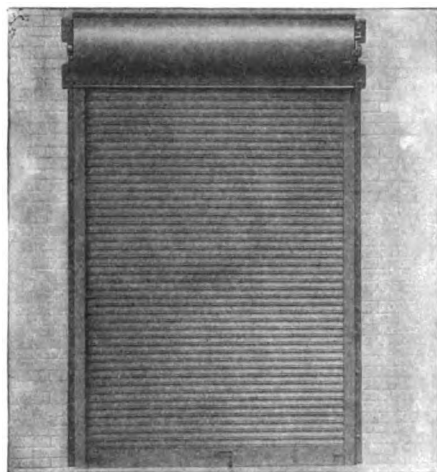
FORD ASSEMBLY PLANT, CAMBRIDGE, MASS.



MILWAUKEE ELECTRIC RAILWAY & LIGHT CO., COLD SPRINGS, WIS.

Some Types of Service Doors—The illustrations below show some of the types of service doors manufactured by this company.

We also supply doors which can be mounted on one side of wall and operated from the other side either with chain or crank.



Elevation



Vertical Section

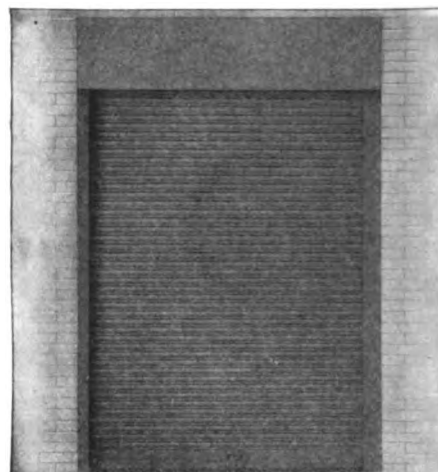


Cross Section



F.M. 10. CONSTRUCTION

Mounted on face of wall.
Push-up type, entirely counterbalanced.
Can be opened or closed from either side.
Provided with suitable lock.
Available for openings not in excess of 100 sq. ft.
Can be made with automatic closing device if desired.



Elevation



Vertical Section

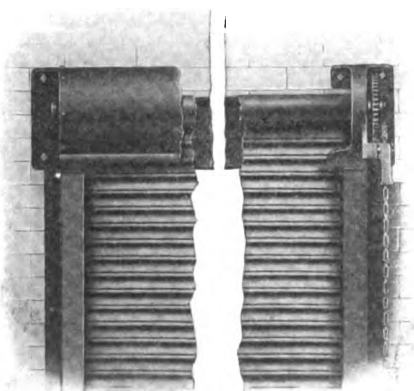


Cross Section



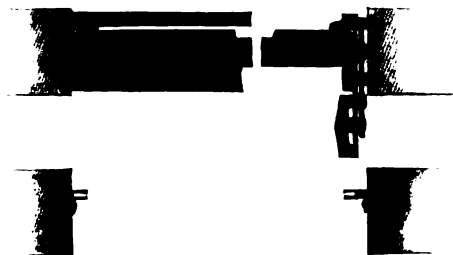
B.M. 10. CONSTRUCTION

Mounted in opening.
Can be opened or closed from either side.
Curtain entirely counterbalanced.
Can be made automatic.
Paneled hoods can be provided.



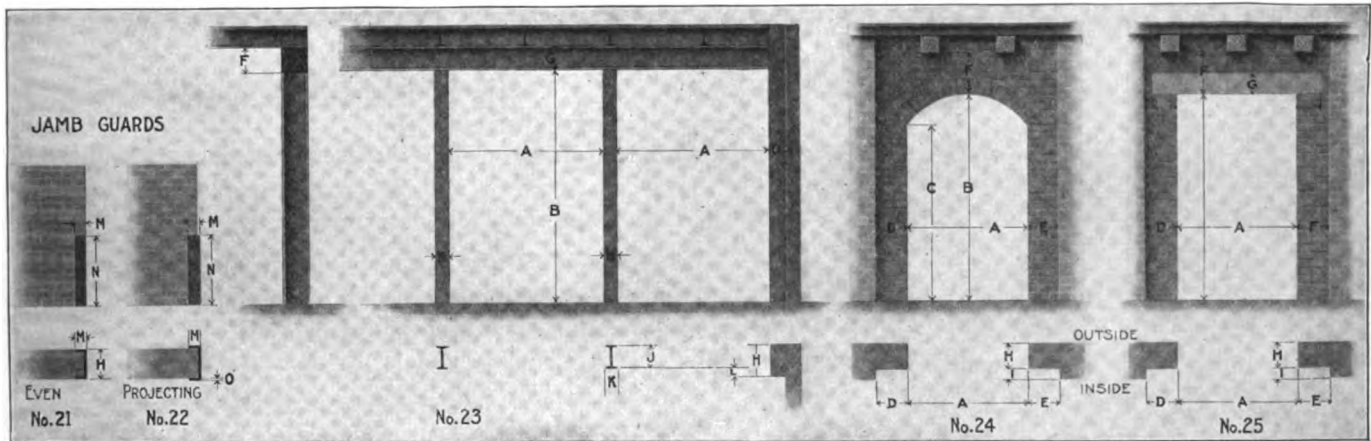
F.H. 20. CONSTRUCTION

Mounted on face of wall.
Curtain counterbalanced.
Operated by means of reduction gearing and endless chain.
Suitable chain lock.
Can be made automatic.

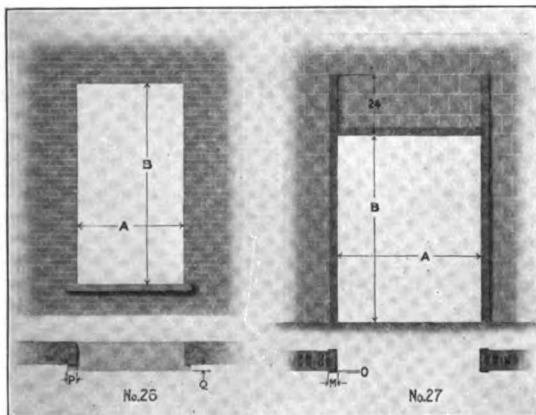


B.H. 20. CONSTRUCTION

Mounted in opening.
Curtain counterbalanced.
Operated by means of reduction gearing and endless chain.
Can be made automatic.
Suitable chain lock.
Paneled hoods where desired.



OPENINGS FOR KINNEAR ROLLING SHUTTERS

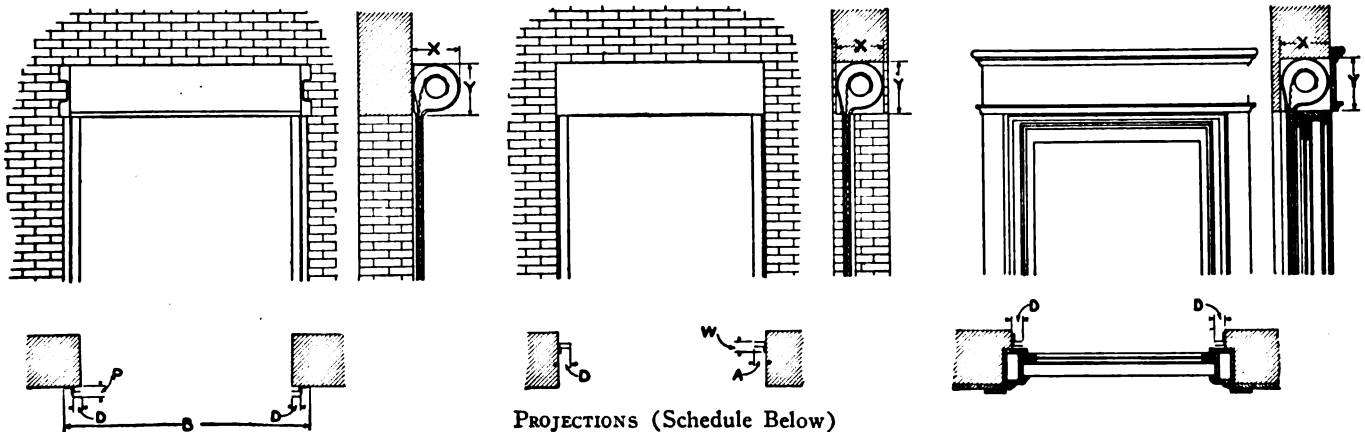


OPENINGS FOR KINNEAR ROLLING SHUTTERS

Information and Measurements Required

Illustrations show essential measurements. In giving information, describe lintel, shapes and sizes of parts composing it, accompanying same with sketch showing cross section. Essential measurements are as follows:

- A—Width; if door is mounted in opening, give width at top and bottom.
- B and C—Height of opening.
- D and E—Projection in close proximity to opening.
- F—Clearance between top of opening and floor beams, or ceiling.
- G—Height of lintel.
- H—Thickness of wall.
- I—Projection of some part of wall near opening.
- J—Depth of column; give shape and sizes of parts composing column.
- K—Width of column.
- L—Distance from column to inner face of wall.
- M—Lap of guard.
- N—Height of guard.
- O—Projection of guard.
- P—Lap of guard.
- Q—Projection of sill.



PROJECTIONS (Schedule Below)

Above are indicated the salient dimensions of usual sizes of standard service types of Kinnear steel rolling shutters. View to the left shows shutter placed on face of wall; central view shows shutter placed between jambs, and that to the right shows curtain with concealed coil. The following dimensions are for shutters of height and width indicated:

Height ft.	Width 3 to 7 ft. Groove Depth "D", 2 in.					Width 7 to 11 ft. Groove Depth "D", 2½ in.					Width 11 to 14 ft. Groove depth "D", 3 in.					Width 14 to 20 ft. Groove depth "D", 3½ in.				
	X in.	Y in.	P in.	A in.	W in.	X in.	Y in.	P in.	A in.	W in.	X in.	Y in.	P in.	A in.	W in.	X in.	Y in.	P in.	A in.	W in.
6	12¾	14	2¾	4	3	13½	15	2¾	4½	3½										
8	14¾	16	2¾	4	3	16½	18	2¾	4½	3½										
10	15¾	17	2¾	4	3	17½	19	2¾	4½	3½										
12	17½	19	2¾	4	3															
6	11	13	2½	4	3	11	13	2½	4½	3½	12¾	14	2½	5	4	15	17	3½	8	4½
8	11	13	2½	4	3	11	13	2½	4½	3½	12¾	14	2½	5	4	15	17	3½	8	4½
10	11¾	13½	3½	4	3	11¾	13½	3½	4½	3½	12¾	14	3½	5	4	15½	18	4	8	4½
12	13½	15	3½	4	3	13½	16	3½	4½	3½	13½	15	3½	7	4	17	19	4	8	4½
14	14¾	16	3½	4	3	14¾	16½	3½	4½	3½	13½	16	3½	7	4	17½	19	4	8	4½
16	15¾	17	3½	4	3	15¾	17	3½	4½	3½	15¾	17	3½	7	4	20	22	4	8	4½
18	15¾	17	3½	4	3	15¾	18	3½	7	3½	17	19	4	7	4	22	24	4	8	4½

Sizes above division line apply to shutters operated by handle in bottom of curtain. Those below division line apply to shutters operated by endless chain or crank and bevel gear. Dimension "P" applies only to face of wall constructions. Dimension "W" only to "between jamb" constructions. Dimension "D" in the between jamb section applies only to manually operated shutters. Use projection "A" for both sides where chain operation is used. Dimension "B" should always be at least 8 in. wider than width of door opening for moderate sized shutters, and for very large shutters 10 or 12 in. and more if possible. We do not recommend manually operated construction for curtains of larger area than approximately 100 sq. ft.; chain hoist should be used on larger sizes. Above does not apply to automatic construction; for clearance on automatic or any other special construction. Any unusual sizes, direct correspondence is advisable.

Bifolding Doors

This type of door can be made with panels either of wood or steel and upper panel can be provided with sash for glass.

Bifold No. 1—Door comprises 2 sections hinged together and supported at center by radial arms pivotally connected to wall brackets.

Chains which communicate with counterbalancing weights are attached at the bottom of lower panel.

Bottom of door is fitted with rollers which travel in guides attached to wall and transmit the thrust.

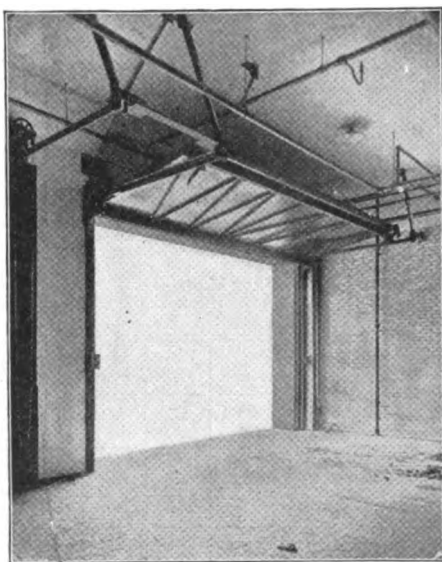
Bifold No. 2—Similar to Bifold No. 1 except that this type is designed for large openings.

It is unnecessary to break door as the operation of unlocking, breaking and raising are accomplished by means of endless chain and suitable reduction gearing.

A reversal of these functions occurs when door is closed. In opening, lower section moves upward a distance of approximately 18 in. when hooks on lower section engage reciprocal members on upper section, door then folds radially to a point above the opening.

Bifold No. 3—Designed for large openings and made in 2 sections.

In operating, the lower section raises to half the height of opening, the door then breaks and both sections move simultaneously, the lower edge vertically, the upper edge horizontally on suspended tracks, to a position above the opening.



BIFOLD NO. 3 IN OPEN POSITION

Vertical Sliding Doors

This type of door is particularly suitable for freight

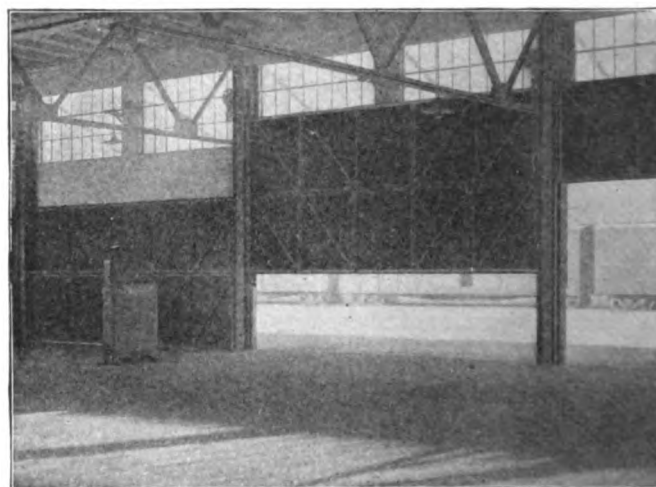
houses, piers and warehouses where light is essential through doors.

The door comprises 2 or more sections consisting of trussed frame covered with corrugated iron, hung independently with chains connected with counterbalancing weights, and is operated by means of endless chain and suitable reduction gearing.

Where doors are mounted on steel columns, guides and weight boxes should be incorporated as a part of the column and be supplied by steel contractor, according to details supplied by our Engineering Department.

This type can also be supplied to be mounted on the face of wall in which case we supply weight box and guides as a part of our equipment.

It is advisable to get definite information from factory in connection with the above type of door.



VERTICAL SLIDING DOORS
Installed in Santa Fe freight shed

Kinnear Fire Doors and Shutters

A complete line of steel rolling fire doors and shutters are manufactured by THE KINNEAR MANUFACTURING Co. under the supervision of the Underwriters' Laboratories, Inc., and are supplied bearing labels under the following conditions:

Class "A"—For openings in fire walls where total area is not in excess of 80 sq. ft. and where neither dimension exceeds 12 ft. Double doors required.

Class "B"—For vertical shaft openings, entrances to bridges or tunnels where total area is not in excess of 80 sq. ft. and where neither dimension exceeds 12 ft. Single doors required.

Class "C"—For openings in corridor or room partitions where total area is not in excess of 80 sq. ft. and where neither dimension exceeds 12 ft.

Class "D"—For openings in exterior walls where total area does not exceed 100 sq. ft. and where neither dimension exceeds 12 ft.

Excess Sizes—Doors in excess of these sizes can be supplied and are constructed in every way similar to the labeled type for classification desired, but can not carry label.

Certification of inspection may be secured by application of owners or purchasers to the Underwriters' Laboratories, Inc., requesting that such inspection be made at the factory.

Operation—Underwriters' labeled doors are furnished to operate in the following manner:

- Push-up and self-coiling.
- Gear operation with endless chain.
- Gear operation with crank and shaft.

Advantages of Kinnear Fire Doors and Shutters

Kinnear labeled steel rolling doors and shutters are fundamentally correct as fire stops.

(1) They are compact, sturdy, always in place, out of sight and out of the way.

(2) They move in a vertical plane and do not consume valuable space.

(3) Curtain is made of interlocking slats formed of extra heavy gauges of steel, which project beyond opening into guides of sufficient depth to insure against excessive deflection either in case of wind pressure or fire.

(4) Malleable end locks riveted to ends of slats are designed to prevent the passage of fire and to take the wear incident to constant use.

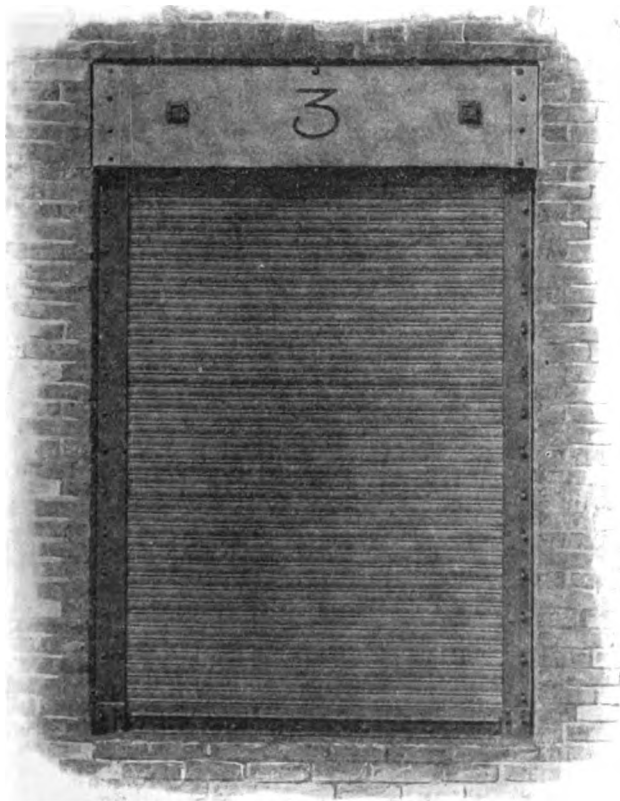
(5) An auxiliary or inner hood is provided to close automatically and, when curtain is in closed position, prevents the passage of smoke or flames through the opening.

(6) Guides are slotted and each bolt for attaching same is provided with a fusible washer which takes care of expansion of guide in case of extreme heat.

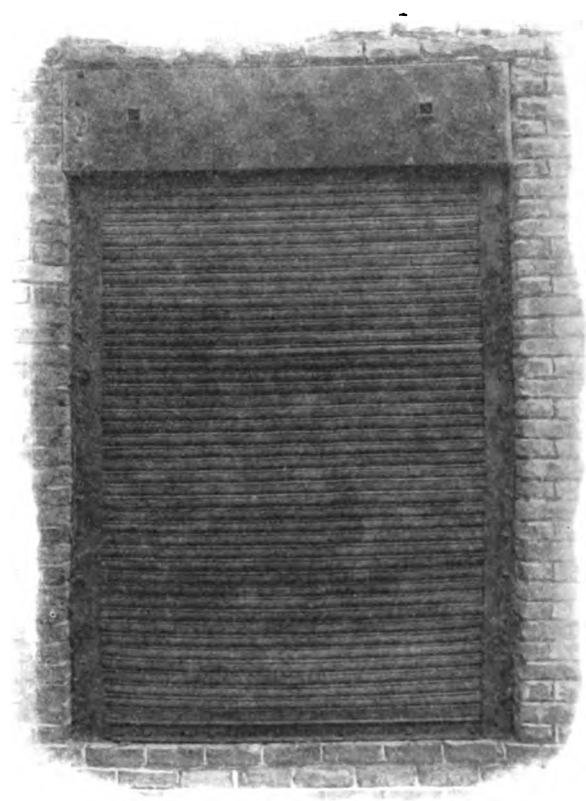
(7) Close automatically from any open position.

(8) Can be reset without difficulty after automatic closure.

(9) Can be provided with *safety device* in the shape of a governor which controls the drop of the door in automatic closure, eliminating all danger and avoiding the violent impact where such device is not used.

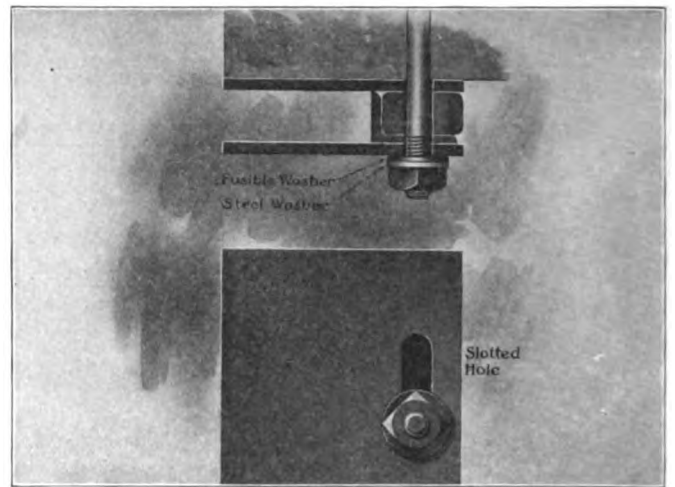
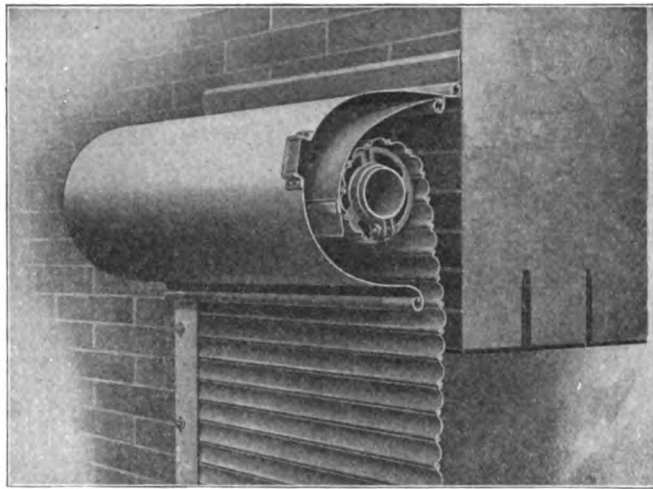


Before Test

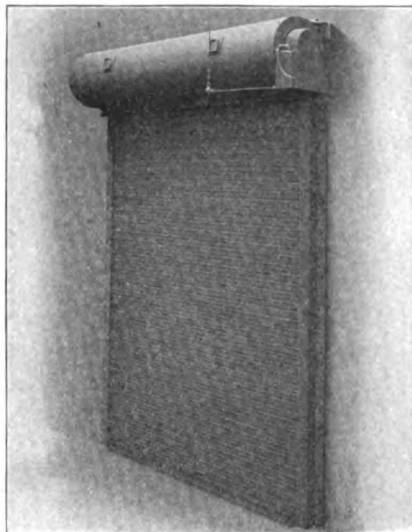


After Test

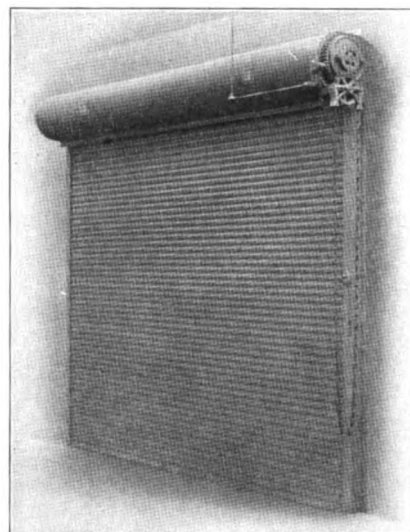
RESULT OF TEST CONDUCTED BY THE UNDERWRITERS' LABORATORIES, INC., ON A KINNEAR FIRE DOOR
The fire temperature was 1880°; illustrations show the side of the door presented to the fire



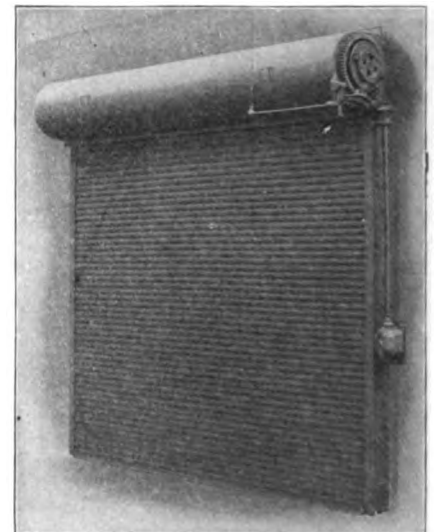
SALIENT FEATURES OF KINNEAR FIRE DOORS AND SHUTTERS



Manual Operation

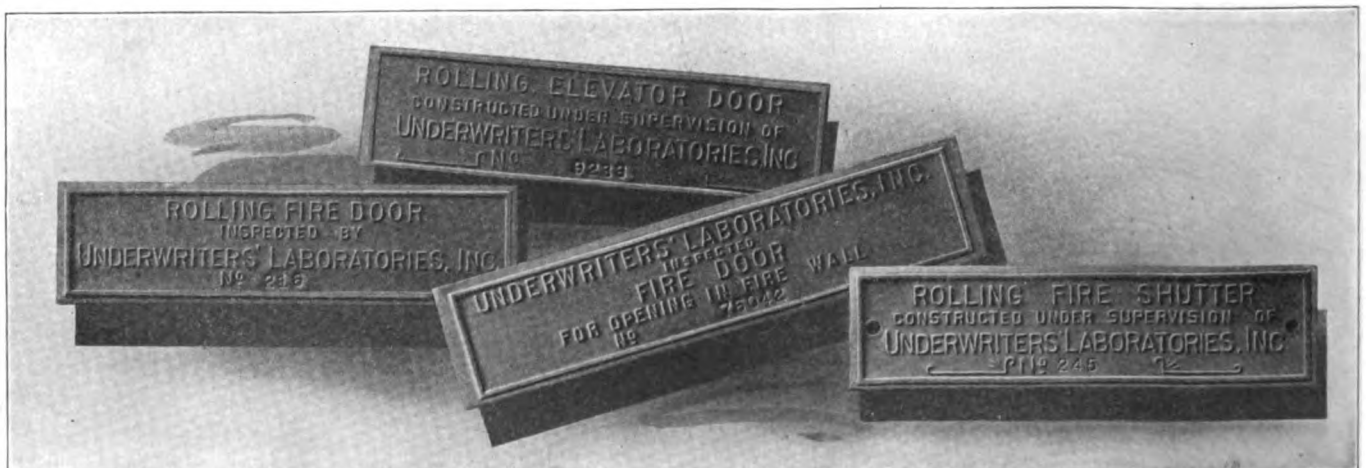


Chain Operation



Crank and Shaft Operation

A FEW TYPES OF AKBAR CONSTRUCTION



UNDERWRITERS' LABELS

Motor Operation for Steel Rolling Doors

To meet the constantly growing demand for power operation in connection with Kinnear steel rolling doors—where applied to large railroad openings, crane openings and other types of large openings—where frequent operation is necessary, we have developed a complete power unit which can be attached to Kinnear doors and which, because of its compactness, is available for all classes of openings.

In order to supply a power unit entirely suitable to requirements we have designed three distinct types which are designated as follows:

Power Unit No. 1

Power Unit No. 2

Power Unit No. 3

Each power unit comprises motor, limit switches, magnetic brake, reduction gear, manual (or emergency) operating mechanism, automatic starter, reversing and service switches.

Limit switches, susceptible of precise adjustment, control the travel of the curtain, stopping it at the proper time; also actuate the magnetic brake and the automatic starter which breaks the circuit, stopping the motor.

The reduction gear is enclosed in heavy cast iron housing, and is made of cast iron and steel, with cut teeth, running in oil bath, the spray lubricating all bearings.

Heavy bearings are bushed with bronze, light bearings are babbitted. Enclosed type of knife switches. Externally operated—safety type are supplied as our standard equipment for operating and service purposes.

Power Unit No. 1—Our heaviest unit, being designed for extremely heavy loads. Either power or

manual operation is secured through the same gear, and either method may be employed without the shifting of clutches.

Power Unit No. 2—Designed for average sized openings and similar in all respects to Power Unit No. 1 except that it is somewhat smaller. Further, this type is essentially a power drive—manual operation intended for emergency only. The emergency chain should be placed on sprocket when needed for manual operation and removed when the motor is employed.

Power Unit No. 3—This unit is small and very compact, and is supplied either to be attached to the bracket or the wall, according to conditions, and is particularly desirable for small doors with limited head-room. It is essentially the same as Power Unit No. 1 except smaller in design.

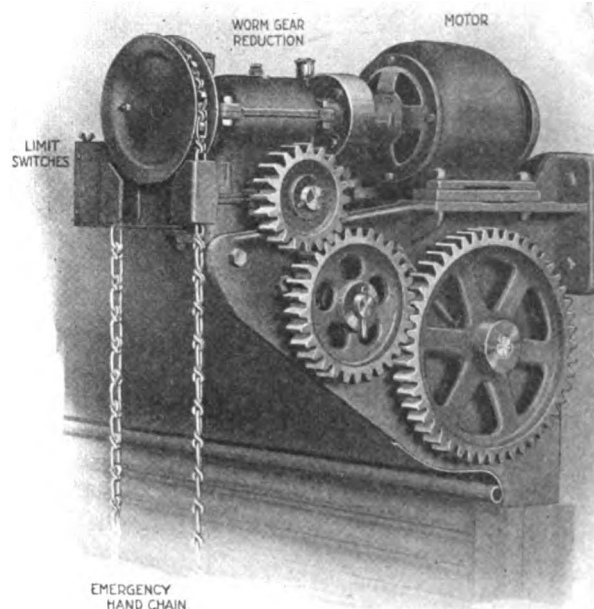
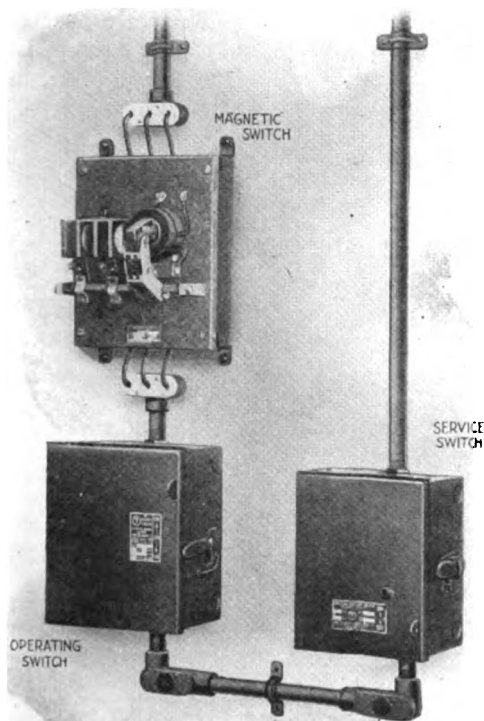
Speed—Our power units are designed to raise and lower curtains at the rate of 1 ft. per second, and are always placed above the openings where possible to do so, being entirely out of the way. The complete equipment is mounted on platform or bracket in most compact form.

Accessories—Wire, wiring and fuses are always furnished and installed by others.

For Quotations—The information necessary to quote intelligently on motor operated doors is, as follows: number and sizes of doors; complete description of current.

Service

A highly developed Engineering Department will solve door problems. Write for catalogue.



No. 3 POWER UNIT COMPLETE

Consists of motor, limit switches, magnetic brake, reduction gear, manual (or emergency) operating mechanism, automatic starter and service switches

GEO. W. JOHNSON MFG. CO.

Manufacturers of Standard Underwriters' Labeled Automatic Fire Doors

1210-1212 South Eighth Street
ST. LOUIS, MO.

209-211 West 17th Street
KANSAS CITY, MO.

Products

STEEL ROLLING DOORS.

COUNTERBALANCED ELEVATOR TRUCKOVER DOORS.

Also manufacturers of Steel Air-space Sliding and Hinged Doors; Vertical Sliding Telescope Doors; Metal Covered Doors; Doors and Frames for Bakery Proof-rooms; Proof-room Door Locks; Tin Clad Fire Doors; Dufold (Jack-knife type) Doors; Boiler Plate Doors; Steel Panel Doors.

Steel Rolling Doors

"Johnson" steel rolling doors are *roller bearing* and the counterbalancing shafts are equipped with multiple springs of highest quality. The doors operate quickly and easily, occupy minimum space and offer a neat and finished appearance from both sides of the opening. The curtains are built of interlocking slats or of corrugated flexible steel; the corrugations being short and deep offer maximum resistance against wind pressure.

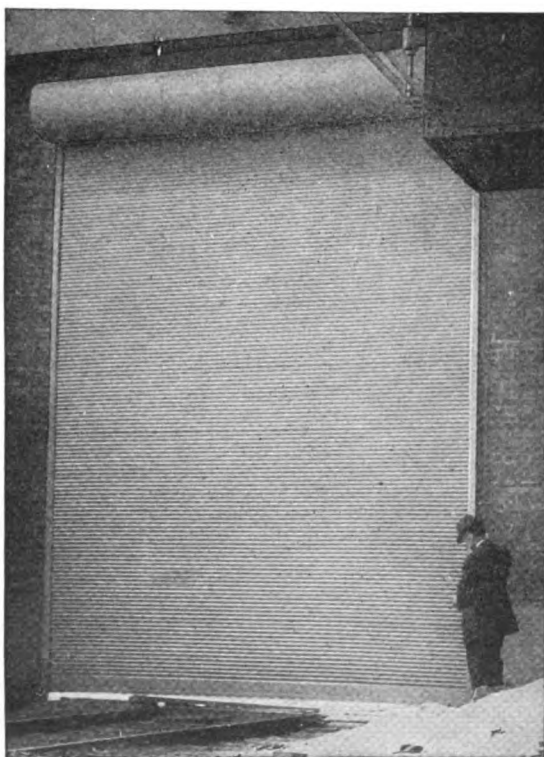
For highest efficiency, we recommend that all steel rolling doors have hoods to cover and protect the coils and that the curtains of both slat and corrugated sheet construction be galvanized.

No. 100, Push Up—Spring counterbalanced, roller bearing, operated by hand. For nominal openings.

No. 100A—Spring counterbalanced, roller bearing, automatic closing. For nominal openings.

No. 110, Chain Operated—Spring counterbalanced, roller bearing, operated by means of endless chain. For large openings.

No. 100 W. C.—An automatic steel rolling door



NO. 110 STEEL ROLLING DOOR INSTALLED ON TRACK OPENING

equipped with perforated shaft containing water pipe. When fuse link releases door in case of fire, water flows over surface of curtain, thereby keeping down radiation and reducing fire hazard. Door can be operated manually without causing flow of water.

Special Features—The Johnson automatic attachments with two fuse links, one placed at the ceiling line, are superior to the old style attachments with link only at the opening.

Experience has demonstrated that the ceiling link released doors where the fire occurred, and in many cases the link at the opening was still intact when fire was extinguished.

Elevator Truckover Doors

The most practical freight elevator door on the market. Serves the purpose of a fire door and elevator safety gate combined, cutting off draft at each floor.

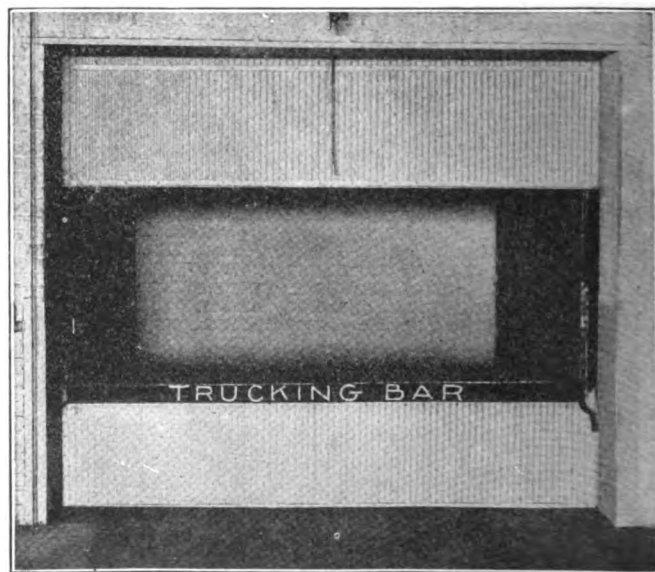
Features—The patented trucking bar is pivoted and conforms to location of elevator platform. If same is below sill level, this bar automatically adjusts itself to the proper angle, giving a smooth surface for trucks, even with small wheels, to pass over without jar or damage to contents.

Another important feature is the interlocking guides, which prevent danger of heavily loaded trucks striking door from room side when closed and forcing same out of guides. Such accidents have occurred when doors were equipped with only plain guides, resulting in contents of truck falling into shaft.

Doors are substantially made and are durable. No weights or springs are required, as one door counterbalances the other with simple and perfect mechanical operation. Doors work easily, and can be equipped with safety attachments.

Details

Write for more particulars and details.



ELEVATOR TRUCKOVER DOOR

THE MOESCHL-EDWARDS CORRUGATING CO., INC.

Manufacturers of Rolling Steel Doors
CINCINNATI, OHIO

Products

"MECCO" STEEL ROLLING DOORS.

Also manufacturers of "Mecco" Fireproof Kalamein Doors; Tin Clad Doors; "Mecco" Fireproof Metal Windows; Kalamein Smoke Screens; "Mecco" Spanish Metal Tile; "Mecco" Roof Ventilators; Cornices, Skylights, Finials, Garages, Gutters, Marquises, Shingles (Tin, Galvanized or Copper), Painted and Galvanized Roofing, Siding and Corrugated Sheets.



Underwriters as such. It incorporates, however, all the desirable features of our closure doors.

They are designed for face of wall erection and are labeled for "fire walls," "vertical shaft" and "corridor or room partitions."

Underwriters' Approval

"Mecco" metal windows, steel rolling doors, kalamein and tin clad doors are approved by the National Board of Fire Underwriters and bear their labels.

Operation of "Mecco" Steel Rolling Doors

Three methods of operation are employed:

Manual—By means of handle at bottom of door.

Mechanical—By means of endless chain, sprocket and gear, or crank, shaft and gear.

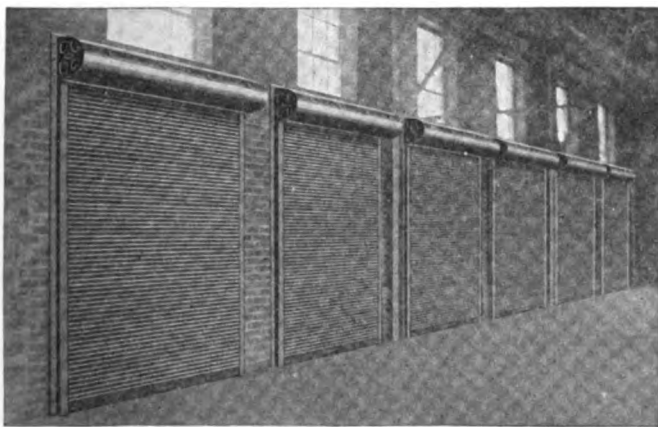
Power—By means of electric motors.

Steel Rolling Doors, Service Type

Doors of this type are designed and sold for the effective closure of openings against weather and intrusion, where it is desirable for the door to occupy a minimum amount of space.

TYPES OF SERVICE DOORS

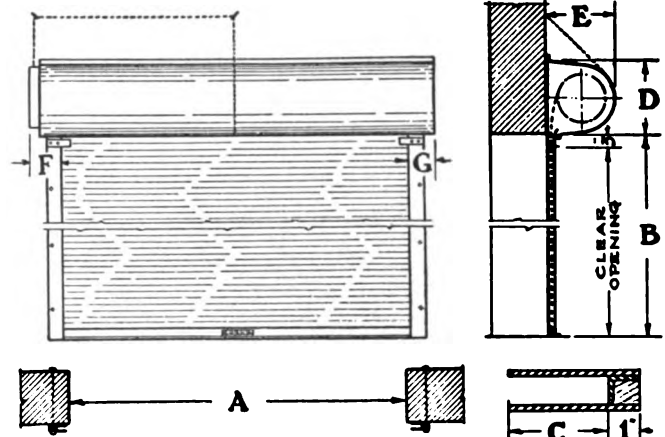
No.	Type of Operation	Wall Mountings
2	Manual	Face of wall
2-A	Manual automatic	Face of wall
4	Manual	Within opening
4-A	Manual automatic	Within opening
6	Chain	Face of wall
6-A	Chain automatic	Face of wall
8	Chain	Within opening
8-A	Chain automatic	Within opening
12	Crank	Face of wall
12-A	Crank automatic	Face of wall



INSTALLATION OF NO. 2 DOORS FOR DRYING OVENS IN ALLIS-CHALMERS MFG. CO., CINCINNATI, O.
(Illustration shows only one-half of installation)

"Mecco No. 100" Door (Labeled)

This door is constructed primarily as a fire retardant and is labeled by the National Board of Fire



DIMENSION DIAGRAMS, "MECCO" No. 100 DOOR

DIMENSION DIAGRAMS, "MECCO" No. 100 DOOR

A—width, ft.	C, in.	F, in.	G, in.	B—height, ft.	D, in.	E, in.
0 to 6	2 1/2	6 1/2	5 1/2	0 to 5	14	12 1/2
6 to 8	2 1/2	7	6	5 to 7	16	14 1/2
8 to 10	3	7 1/2	6 1/2	7 to 10	18	16 1/2
10 to 12	3 1/2	8	7	10 to 12	20	18 1/2

Underwriters' Requirements

For the convenience of engineers and architects we are giving a skeleton specification of the requirements of the National Board of Underwriters for rolling steel doors. These doors are all automatic closing and the specifications governing square foot area, gauge of curtain, etc., must be adhered to.

Maximum area of labeled doors permitted by the underwriters for interior openings is 80 sq. ft. Maximum width or height is 12 ft.

Metal in curtain for "vertical shaft," "corridor or room partitions" must be No. 20 gauge galvanized.

For "fire walls" metal in curtain must be No. 16 gauge galvanized.

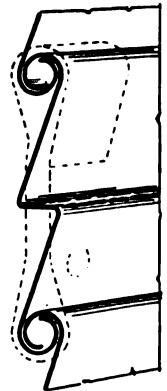
One door is required for opening in "vertical shaft" or "corridor or room partitions."

Two doors are required for opening in "fire walls."

Slat Construction

The attention of engineers and architects is especially directed to the center member of the slat. Any pressure, wind or otherwise, exerted against the door is effectively resisted by this formed Z-bar.

The ends of the slats are thoroughly protected by malleable iron castings riveted to the end of the slats.



SLAT CONSTRUCTION
"MECCO" STEEL ROLLING DOORS

THE J. G. WILSON CORPORATION

Manufacturers of Rolling Steel and Wood Doors and Shutters

TELEPHONE

VANDERBILT 9636, 9637

GENERAL OFFICES
24 East 36th Street
NEW YORK, N. Y.

CABLE

"LYDIAN, NEW YORK"

OFFICES

ATLANTA, J. M. VAN HARLINGEN
BALTIMORE, THE J. G. WILSON CORPORATION
BILLINGS, F. W. RICHARDSON
BOSTON, E. A. BAKER
BUFFALO, THE J. G. WILSON CORPORATION
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CINCINNATI, CINCINNATI BUILDERS SUPPLY CO.
CLEVELAND, R. L. QUEISSER CO.
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DAYTON, BUILDING PRODUCTS CO.
DENVER, COLORADO BUILDERS SUPPLY CO.
FT. WORTH, H. L. AGE
HARTFORD, THE J. G. WILSON CORPORATION

HONOLULU, GRACE BROS.
HOUSTON, F. B. WALCOTT
KANSAS CITY, J. P. SPRAGUE CO.
LOS ANGELES, THE J. G. WILSON CORPORATION
MINNEAPOLIS, JOHNSON, JACKSON & CORNING CO.
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NORFOLK, W. L. ROCHE
PITTSBURGH, H. H. CHARLES
PHILADELPHIA, THE J. G. WILSON CORPORATION
PHOENIX, WALTER DUBREE
PORTLAND, F. W. FARRINGTON & CO.
PUEBLO, M. R. SCHWER & CO.
RICHMOND, J. S. ARCHER

ROCHESTER, BUILDING SPECIALTIES CO.
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SCRANTON, LEBAR, PARSONS & PIERCE
SEATTLE, S. W. R. DALLY
ST. LOUIS, THE J. G. WILSON CORPORATION
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SYRACUSE, H. L. WATERMAN
TOLEDO, BUILDING PRODUCTS CO.
WASHINGTON, D. C., THE J. G. WILSON CORPORATION

Products

WILSON STEEL ROLLING DOORS and SHUTTERS, labeled and unlabeled; WILSON ROLLING WOOD DOORS.

Also manufacturers of Sectionfold and Rolling Partitions; Disappearing Door and Rolling Front Wardrobes; Rolling Fronts; Lightproof Shutters; Diffuselike Blinds, Paint and Fixtures.

The J. G. Wilson Corporation

THE J. G. WILSON CORPORATION was founded in 1876, or forty-six years ago and has had a longer experience than any other concern manufacturing similar products. Wilson is the pioneer American manufacturer of most of the building specialties it makes and for many years Wilson has been the accepted standard of superior quality. There is scarcely a city or town in the United States without Wilson installations and Wilson products are shipped all over the world.

The Wilson factory occupies 17 acres of ground with 12 buildings, representing a floor space of nearly 200,000 sq. ft., or 5 acres under roof. Well arranged modern equipment permits of a large volume of production at the lowest possible cost consistent with recognized Wilson quality. The location of the factory permits direct shipment either by rail or water.

Why Wilson Rolling Steel Doors are Desirable

Wilson rolling steel doors are economical, durable and convenient. They require less floor space than any other type of door and do not interfere with piping or windows, and may be concealed if desired. The overhead coils are out of the way. Wilson rolling steel doors are the most rugged doors of this type made. They resist fire and discourage theft. They can be operated as quickly as any other type of door and are very easy and economical to maintain. All Wilson products are sold under a service guarantee.

Where Wilson Rolling Steel Doors are Used

Wilson rolling steel doors and shutters are designed to meet all classes of service: first, the effective closure of openings against weather and intrusion; second, the closure of openings where fire doors are required. The following list of installations gives a very good idea of the many places where Wilson doors are most satisfactory:

Air intakes	Banks	Car barns
Art galleries	Boats	Commercial buildings
Bakeries	Boiler fronts	Core ovens

Corridors
Craneways
Courthouses
Door openings
Driveways
Elevator shafts
Factories
Fire walls
Foundries
Freight sheds

Garages
Grain elevators
Gymnasiums
Hangars
Hotels
Loft buildings
Manufacturing plants
Newstands
Office buildings
Passenger stations

Piers
Residences
Schools
Searchlights
Skylights
Stairways
Stores
Ticket cases
Warehouses
Windows

Wilson Interlocking Slat Curtain

The Wilson curtain, that part of the door closing the opening, is formed of a series of heavily galvanized interlocking steel slats. They are galvanized by the modern electro-galvanizing process which insures a uniform coating and permanent adhesion of spelter to the steel, even under distortion. Electro-galvanizing is responsible for the extraordinary resistance of the Wilson slat to corrosion and is the reason why one seldom sees new slats in an old Wilson rolling steel door.

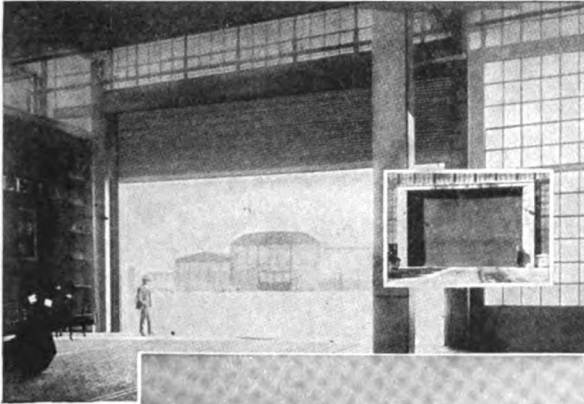
These slats are restrained from side slip by patented malleable iron shields riveted to the ends of alternate slats. These shields form a wearing surface for the curtain as it operates in the groove, protect slats from abrasion, and help to provide the ease of operation which is distinctly Wilson.

The Wilson curtain is so designed that the weight is symmetrical about the center line. This balanced design reduces friction and is another important reason for the easy operation of the Wilson door, even though lubrication has been neglected for years. All Wilson curtains present practically the same appearance from both sides of the opening. The angle bar at the top of the Wilson curtain prevents it from tearing free from the shaft. Wilson interlocking slats are made in the 3 following types:

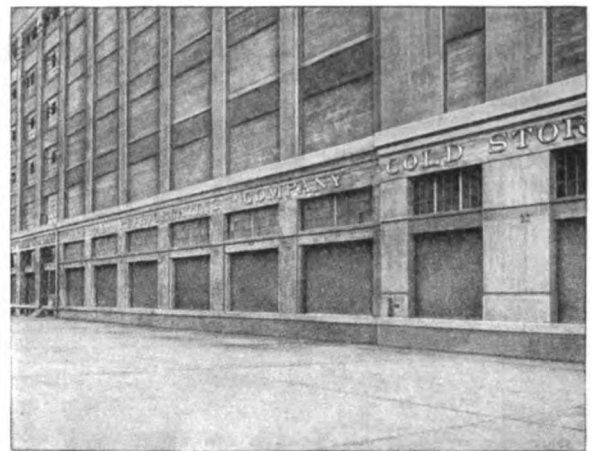
"Big 4" Interlocking Slat—This Wilson leader has the advantage of deep corrugations which materially increase the rigidity and strength of the curtain. The shape of slat is so designed as to protect the interlock from abrasion on both sides of the opening. The "Big 4" type is especially recommended for large openings, because of its strength, durability and ease of operation. This slat will resist unusually severe winds when Wilson safety anchors are used. Made in Nos. 22, 20, 18 and 16 U. S. Standard gage.



"BIG 4" INTERLOCKING SLAT



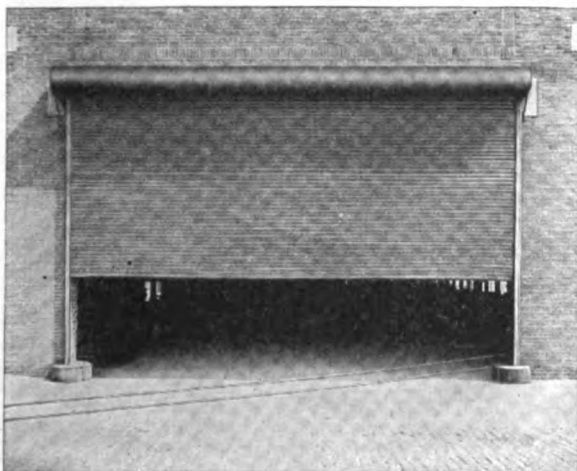
FORD MOTOR
Co.,
KEARNEY,
N. J.



WHOLESALE TERMINAL WAREHOUSE,
LOS ANGELES, CAL.



PHILADELPHIA & READING R. R. FREIGHT STATION,
PHILADELPHIA, PA.



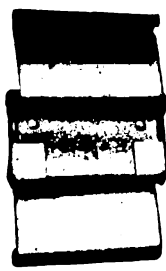
MORRIS WHEELER BUILDING,
PHILADELPHIA, PA.



LAIRD SCHORER COMPANY,
PHILADELPHIA, PA.

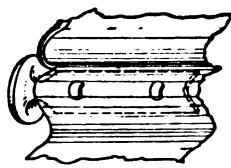
A FEW OF THE J. G. WILSON CORPORATION ROLLING STEEL DOOR INSTALLATIONS

No. 2 Interlocking Slat—Especially designed for use on underwriters' labeled fire doors. Made in Nos. 20, 18 and 16 U. S. gage. No. 2 interlocking slat curtain of the underwriter type is equipped with fire stops in the grooves, baffle plates in the hood and automatic devices which make it superior for fire door use.



NO. 2 INTERLOCKING SLAT

"Little 4" Interlocking Slat—Similar to the "Big 4" slat in appearance, but the depth of corrugation is slightly less. Used in small doors for openings where coil space must be made as small as possible and for underwriters' labeled exterior wall openings. Made in Nos. 22 and 20 U. S. gage.



SAFETY ANCHOR

Safety Anchors

Wilson patented safety anchors may be used on small openings and are always used on doors over 14 ft. wide. They fit into specially constructed rabbeted grooves and positively prevent dislodgment of curtain from the

guides. No door subjected to severe wind or particularly hard service should be without safety anchors. This is a distinctive Wilson feature.

Wilson Shaft Construction

The Wilson shaft supporting the curtain is made of standard weight, commercial black iron pipe, the diameter and thickness depending on weight to be carried. Shaft is attached to bracket by means of malleable iron journals. Wilson self-lubricating bearings are insurance against friction or neglected maintenance. Inside the shaft are helical springs adjusted to counterbalance weight of curtain. The proper design of these springs is fundamental for the proper operation of the door. Each Wilson door is provided with counterbalancing springs made under the supervision of Wilson engineers and tested to meet the exact requirements of that particular door. The care taken in the design and manufacture of Wilson springs is largely responsible for the continued easy operation of Wilson doors after many years use.

Operation of Wilson Rolling Steel Doors

Wilson rolling steel doors may be operated from either side of opening. Small doors are usually self-coiling, and large doors are usually operated by endless chain and gears, crank and gears, or electrically.

Self-coiling Operation—Wilson Nos. 1441 and 1794 are operated by hand by means of handles at bottom of door. This type is best for openings 8x10 ft. or less, and for curtains weighing less than 600 lbs.

Chain or Crank Operation—Should be used for curtains weighing from 600 to 1700 lbs. and for doors larger than the limitations of self-coiling operation. Wilson Doors Nos. 2800 and 2900 are operated by means of chain and gears. Wilson Nos. 3368 and 3363 are operated by crank and gears. Various types of simple and combination gears are used as required and Wilson provides proper gearing for each individual door. All gears are 4 pitch and all journals cold rolled steel. Every part is easily accessible for repairs or lubrication, another point of Wilson superiority.

Motor Operation—For doors over 14 ft. in width, or containing more than 200 sq. ft., or weighing more

than 2000 lbs. Electric motors are supplied to meet requirements. Motors are directly connected by flexible couplings to reduction gears. Transmission of power from reduction gear to door shaft is accomplished by means of roller chains, eliminating the trouble due to possible inaccurate alignment of direct gearing.

Wilson motor operated doors are controlled by means of enclosed reversing switches. Where limit control is desired, push buttons and reversing switches of the contractor type are used. Travel of door is governed by worm limit switches in conjunction with solenoid brakes. Doors electrically controlled may be operated independently or in groups. Emergency hand operators supplied with each power unit.

Hinged Wicket Doors

Standard size 2x5 ft. May be placed in any closure door, preferably at the side. Designed so that the wicket with its frame can be swung back out of the way before raising the curtain.

Wilson Rolling Steel Fire Doors (Labeled)

Exceptionally durable and equipped with special fire protective devices. Close automatically in case of fire and are approved and labeled by the Underwriters' Laboratories, Inc. for the following services:

Vertical Shafts, Corridors and Room Partitions—Area of opening not to exceed 80 sq. ft.; neither width nor height of opening to exceed 12 ft. Curtains may be hung on face of wall or between jambs, self-coiling or crank operation, and are automatic closing in case of fire. Specify Wilson type Nos. 21 to 26 inclusive, interlocking slat No. 2, No. 20 gage.

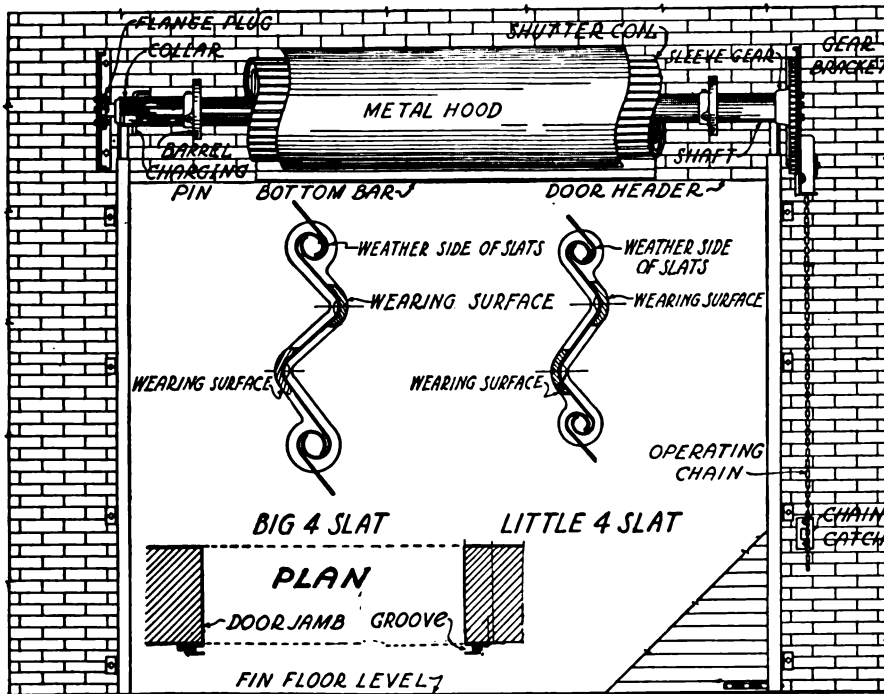
Fire Walls—Area of opening not to exceed 80 sq. ft.; neither width nor height to exceed 12 ft. Two doors are required and may be hung on face of wall or between jambs, self-coiling or crank operation, and close automatically in case of fire. Specify Wilson type Nos. 31 to 35 inclusive, interlocking slat No. 2, No. 16 gage.

Exterior Walls—Area of opening not to exceed 100 sq. ft.; maximum dimensions not to exceed 12 ft. Curtain may be hung on face of wall or between jambs, self-coiling, chain or crank operation, and, where permitted, may be automatic closing in case of fire. Specify Wilson type Nos. 41 to 49 inclusive, interlocking slat "Little 4," No. 22 gage.

Automatic Closing Device—Wilson automatic closing fire doors are easily reset after released. Doors over 10 ft. high or weighing more than 400 lbs. are equipped with an automatic centrifugal brake to retard speed of closing and prevent damage by impact. The Wilson Corporation manufactures doors according to underwriters' specifications for openings too large to be labeled. In such cases they provide a certificate of inspection from the Underwriters' Laboratories, Inc.

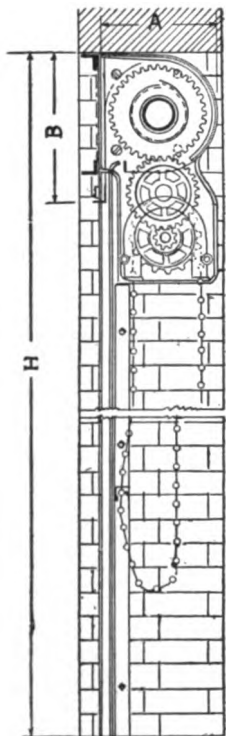
Installation

THE J. G. WILSON CORPORATION prides itself on its corps of experienced erectors, thoroughly equipped to properly install Wilson doors in the least possible time. Erection is a service which is generally appreciated, even though Wilson doors can easily be installed by a competent mechanic. All Wilson doors should operate properly at all times, and the service of Wilson erectors is always available to this end.

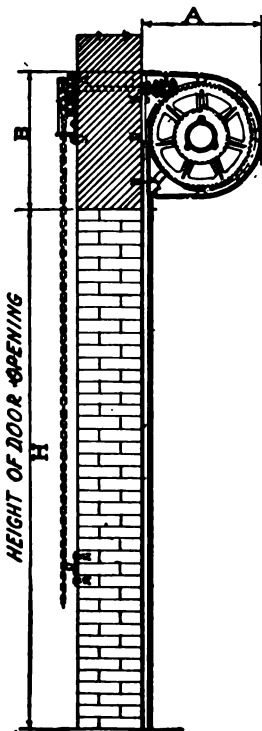


**ELEVATION
WILSON NO. 2800**

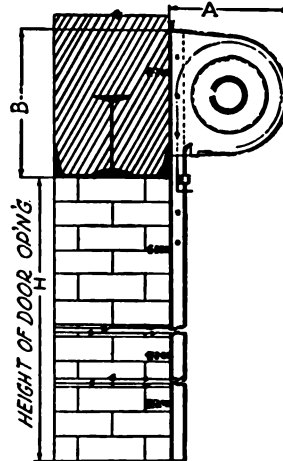
**WILSON NO. 2800
CHAIN GEAR - FACE OF WALL**



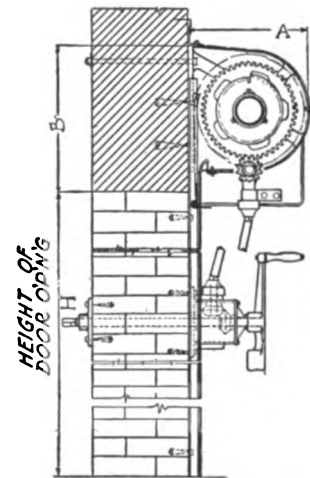
**WILSON NO. 2900
CHAIN GEAR - BETWEEN JAMBS**



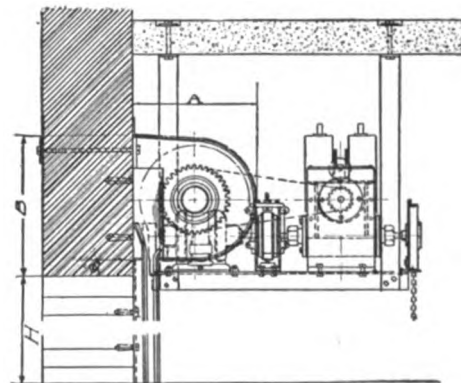
**WILSON NO. 3368
CHAIN GEAR - THRU WALL**



**WILSON NO. 1794
SELF COILING - FACE OF WALL**



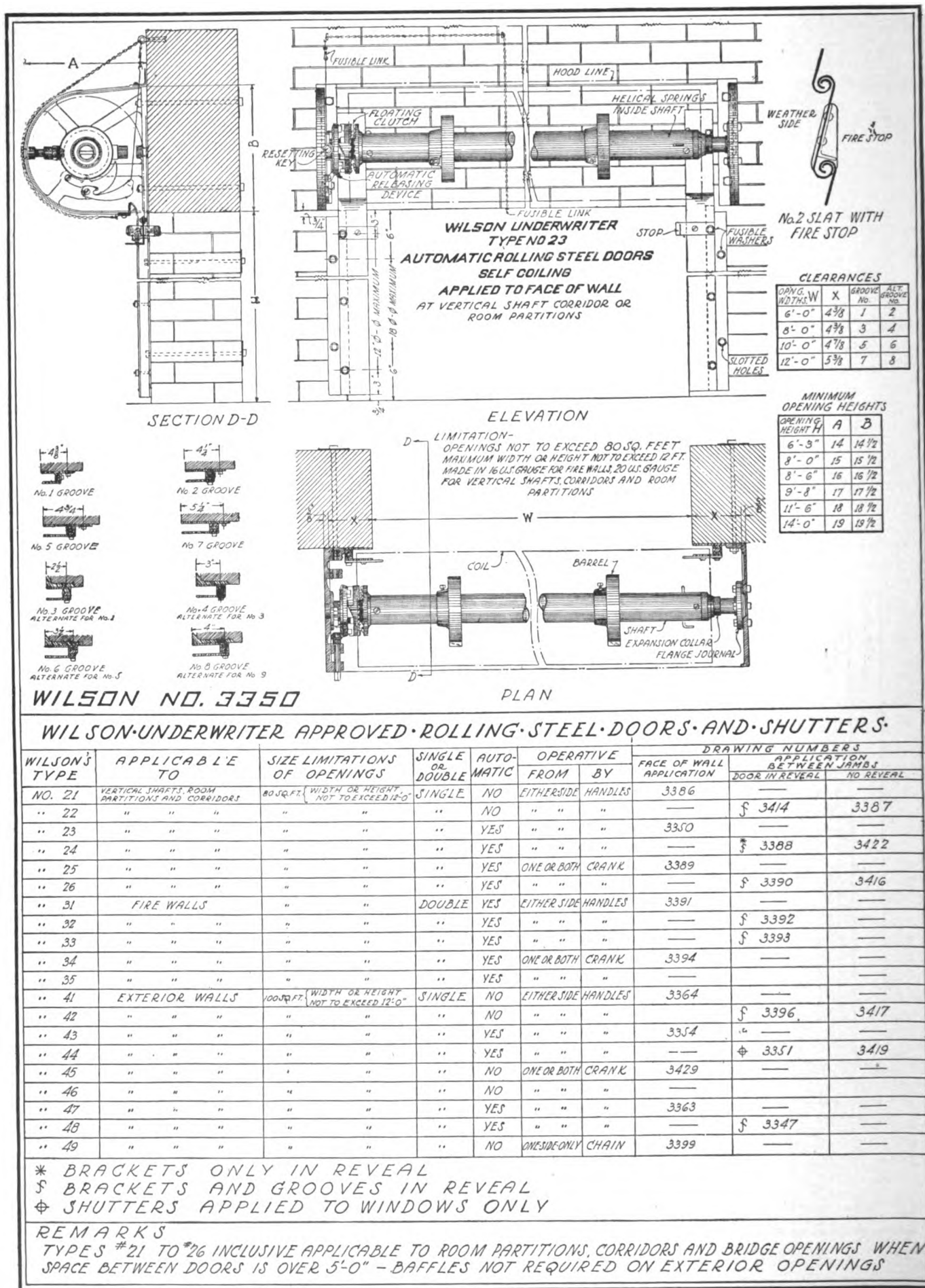
**WILSON NO. 3375
CRANK GEAR - FACE OF WALL**



**WILSON NO. 3323
MOTOR OPERATED**

SCHEDULE
CLEAR SPACE REQUIRED FOR MECHANISM ABOVE DOOR HEADER.

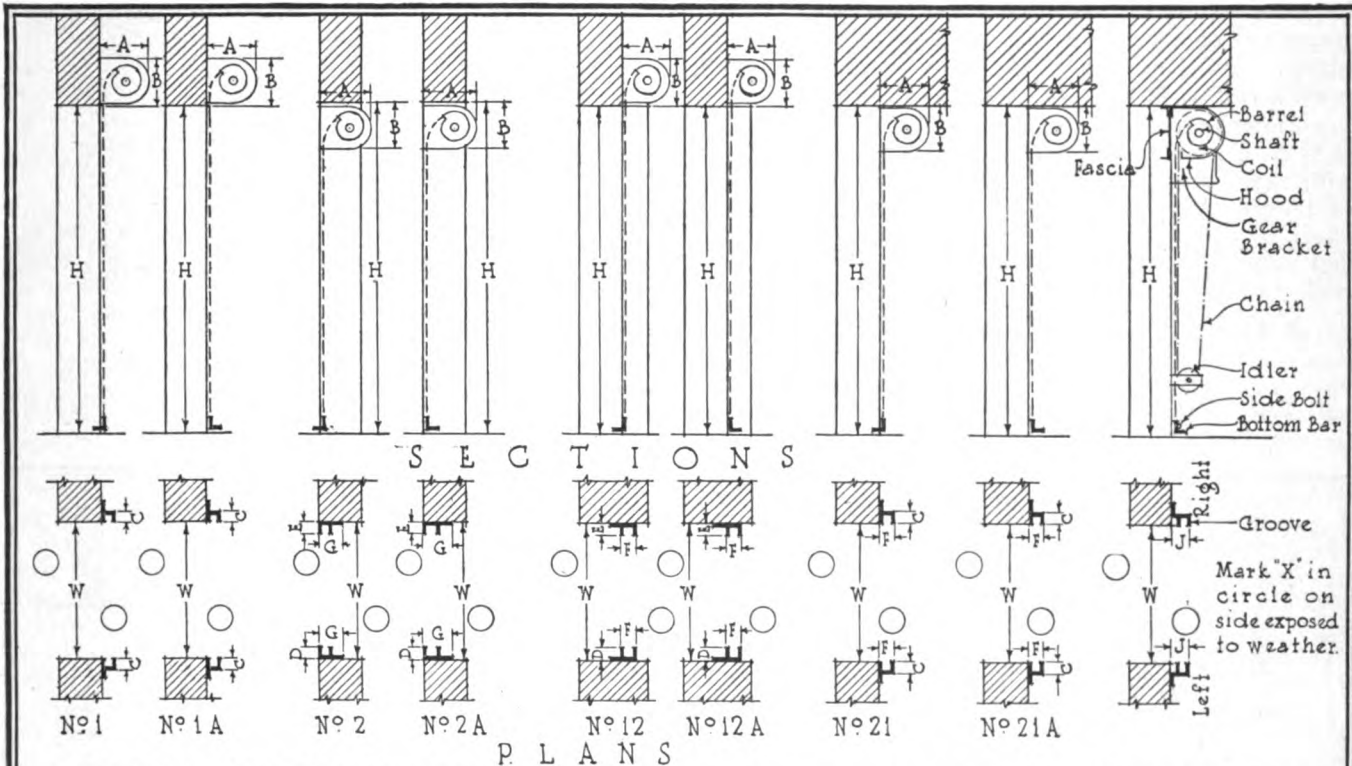
H	B	A	H	B	A	H	B	A	H	B	A
6'-0"	18"	15 1/2"	13'-0"	23"	20 1/2"	20'-0"	26"	23 1/2"	27'-0"	29"	26 1/2"
7'-0"	18"	15 1/2"	14'-0"	23"	20 1/2"	21'-0"	26"	23 1/2"	28'-0"	31"	28 1/2"
8'-0"	19"	16 1/2"	15'-0"	23"	20 1/2"	22'-0"	28"	25 1/2"	29'-0"	31"	28 1/2"
9'-0"	19"	16 1/2"	16'-0"	24"	21 1/2"	23'-0"	28"	26 1/2"	30'-0"	31"	28 1/2"
10'-0"	20"	17 1/2"	17'-0"	25"	22 1/2"	24'-0"	29"	26 1/2"			
11'-0"	20"	17 1/2"	18'-0"	25"	22 1/2"	25'-0"	29"	26 1/2"			
12'-0"	21"	18 1/2"	19'-0"	25"	22 1/2"	26'-0"	29"	26 1/2"			



Wilson Service

Wilson engineers are not only specialists in door and window closures, but have had years of experience as an organization, priding itself on its ability to overcome the most difficult conditions of design and construction.

The service of this organization of specialists is always available to architects or engineers when desired. THE J. G. WILSON CORPORATION feels that true service to the customer entails that it assume complete responsibility for its products.



DIAGRAMS SHOWING DIFFERENT LOCATIONS FOR ROLLER AND GROOVES, WITH SELF COILING CHAIN GEARED AND WORM GEARED ROLLING STEEL SHUTTERS

STANDARD DIMENSIONS IN INCHES OF VARIOUS SIZES OF WILSON ROLLING DOORS & SHUTTERS

HEIGHT IN FEET	WIDTH 3'-0" TO 6'-0"										WIDTH 6'-0" TO 12'-0"										WIDTH 12'-0" TO 15'-0"										WIDTH 15'-0" TO 20'-0"																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
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3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 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Wilson Wood Rolling Doors and Shutters

Uses—Especially made to withstand the corrosive fumes so destructive to iron and steel. Their use is recommended for roundhouses, powerhouses, engine rooms and other places where corrosive fumes are generated. They are also recommended for use on wood constructed warehouses and the like.

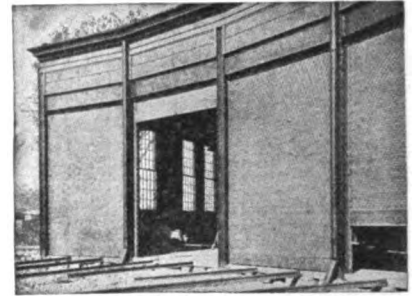
Construction—These doors are made of wood slats 2 in. wide and about $1\frac{1}{8}$ in. thick, fitted together with rule joints, edge to edge, and threaded on bands of bronze metal running from the top to the bottom about 18 in. apart. Each band is riveted to the top slat and attached at the bottom to a strong spiral spring anchor of phosphor bronze.

Automatic Action—When the door is 5 ft. from the lintel it will proceed automatically from this point until it reaches the lintel. This prevents the door being pulled up short of the lintel and becoming damaged by the engine striking it.

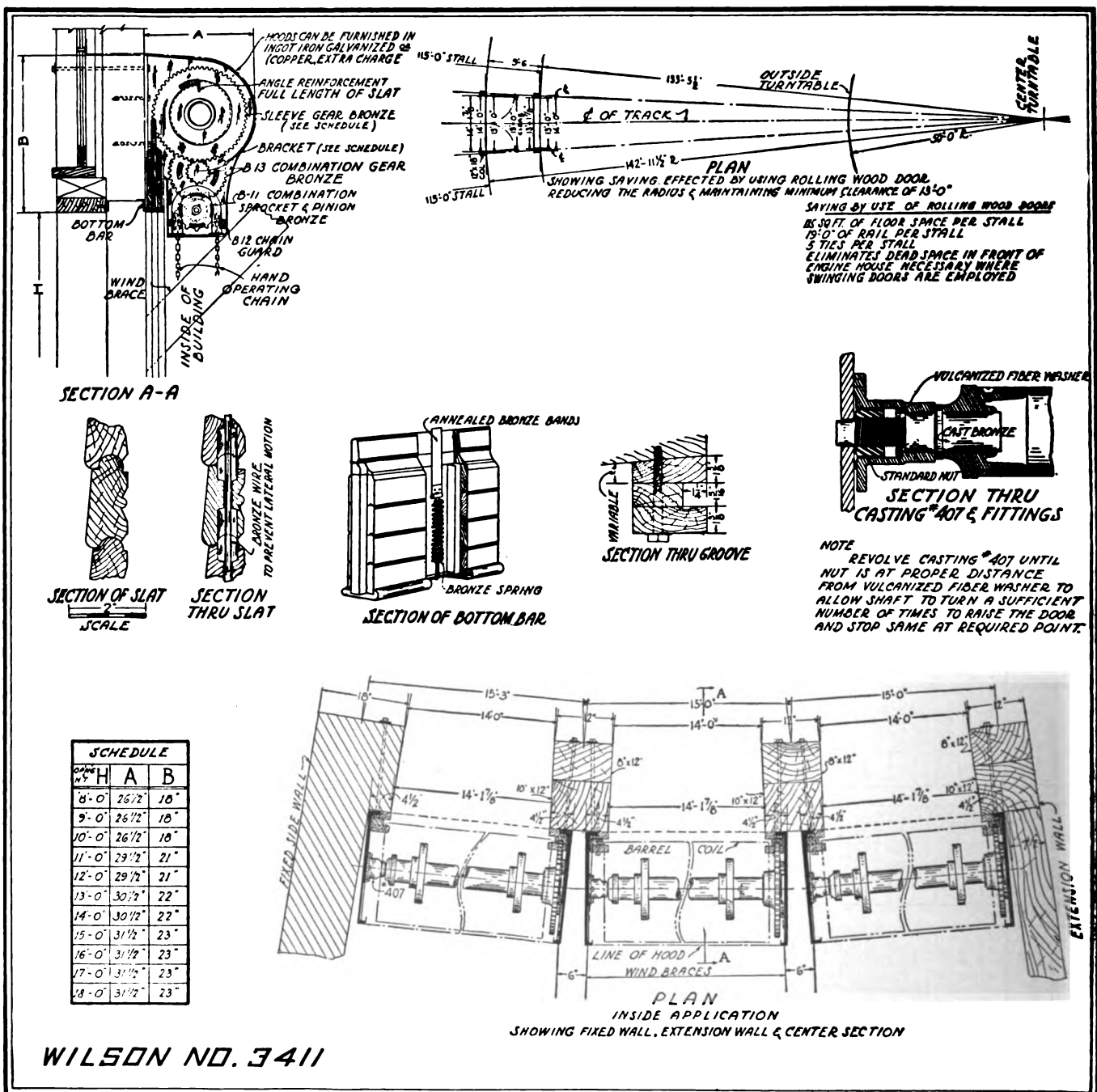
Finish—The doors are treated with carbolineum, reducing to a minimum any expansion or contraction.

Operation—The Wilson chain gear operates quickly and easily. It requires less than one minute to open or close the opening.

Cost—Note plans below. By the use of these doors there is a saving of at least 108 sq. ft. of floor space per stall, 14 ft. of rail per stall, 4 ties per stall. There is not the dead space in front of the engine house necessary where swinging doors are used.



WILSON ROLLING WOOD DOORS ON ROUNDHOUSE



AMERICAN FENCE CONSTRUCTION CO.

Woven Wire Fences and Iron Railings

GENERAL OFFICES

130-132 West 34th Street

NEW YORK, N. Y.

SALES OFFICES IN PRINCIPAL CITIES

TELEPHONE
FITZROY, 0680

Products

Manufacturers of and contractors for AFco WIRE LINK STEEL FENCING and AFco SOLID WROUGHT IRON PICKET and ANGLE IRON PICKET RAILINGS for mills and factories, institutions, public grounds, railway terminals, etc.; IRON GATES and GATE POSTS.

Also manufacturers of Woven Wire Fencing of Regular or Non-climbable types, Window Guards, Machinery Guards, Tool Room Enclosures, Wire or Iron Lawn Fences and Gateways, Tennis Court Enclosures, etc.

Co-operative Service and District Representatives

Fencing for any factory or institution presents its own peculiar problems. The designing and estimating departments of this company have been meeting such problems for years, and to supplement their work the services of district representatives are available in many points throughout the United States without charge.

For information about any items mentioned in the products paragraph but not shown on these pages, send for the complete Afco factory fence catalogue.

Erection

This company does the erection work for a large percentage of its fence output. A well equipped construction force is maintained, but when erection is not desired, shipments of materials are accompanied with instruction drawings and setting plans showing proper method of erecting, insuring correct mechanical installation.

Standardized Afco Factory Fences

Types 1103 with top rail, and 1003 without top rail, as illustrated, are standard and carried in stock in heights of 7 and 8 ft. over all, the wire fabric being a 2-in. mesh of either No. 9 (medium weight) or No. 6 (heavy weight).



Special heights up to 12 ft. can be furnished with various sizes of wire or mesh, either larger or smaller than standard.

The execution of all special orders is subject to delay, and will take advanced costs, depending on the particular order.

End, Corner and Gate Posts—In Afco fences these posts are made of unusually heavy tubular sections (see Specification Data).

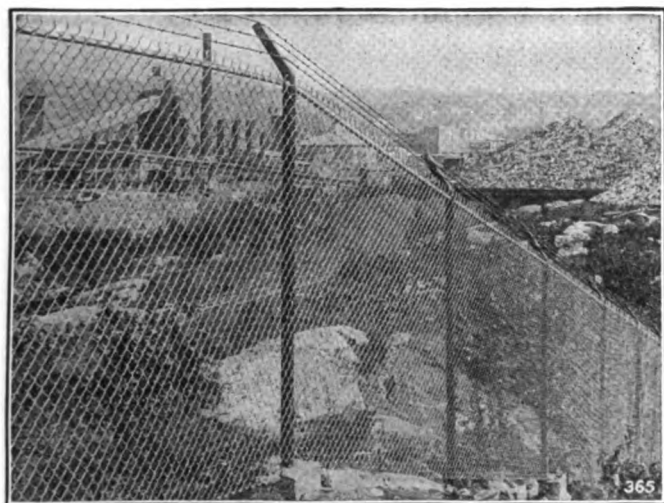
Line Posts—The backbone of any fence is its line posts. For that reason the standard spacing for line posts in Afco fences is 8 ft.

These line posts are 2x2-in. high carbon steel angles, having a wall thickness of $\frac{1}{4}$ in., with integral arm for carrying the barbed wire overhang. For fences with top rail such as type 1103, one leg of the angle is punched for the rail to pass through. Thus all bolted parts or slip-over fittings are eliminated, and the frame work can not be broken down or dismantled after having been assembled.

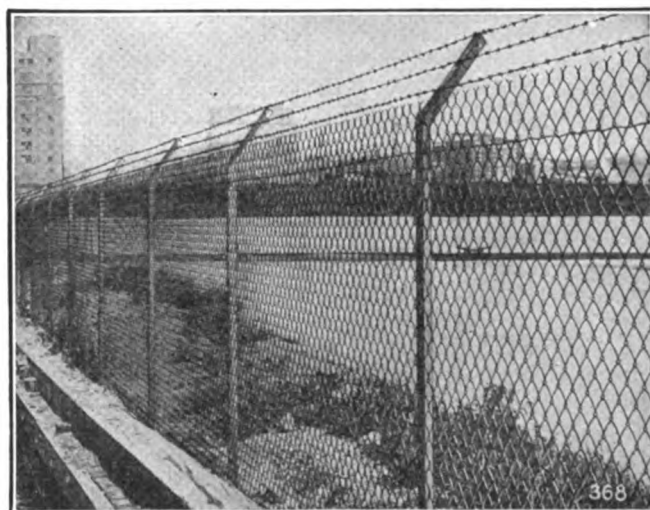
Wire Link Fabric—Afco wire link is made of galvanized wire, carrying 70 lbs. of spelter per ton, nearly double the quantity used on ordinary galvanized wire. After weaving, this fabric receives a special oil treatment which further increases its rust resisting qualities.

Galvanizing—In Afco fences with galvanized framework the galvanizing is done by the hot dip process *after fabrication*, covering all cut ends, punched holes, etc. No raw metal is left exposed. All bolts used are hot dip galvanized, the threads not being recut, a radical departure from the method in common practice.

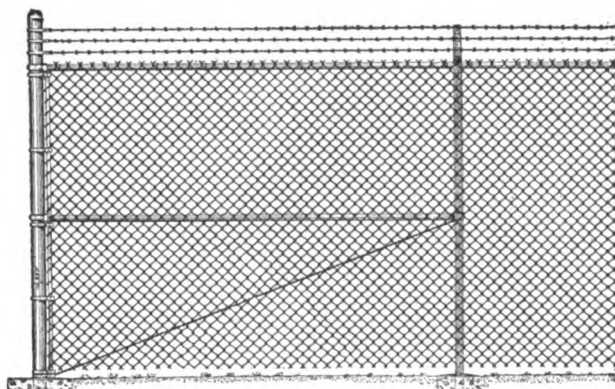
Post Footings—Afco fences are erected with posts set in concrete. Contrary to common opinion this costs no more than other methods of anchoring posts, insures permanent alignment of the fence, and preserves the steel underground.



TYPE NO. 1103 AFco WIRE LINK FENCE WITH TOP RAIL
Fence 7 ft. high over all, enclosing property of International Paper Co., Berlin, N. H.
Entire framework galvanized, and all posts set in concrete footings. Fabric is 2-in. mesh of No. 6 wire

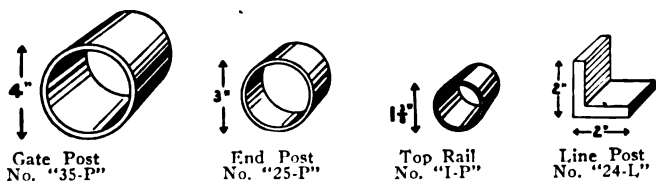


TYPE NO. 1003 AFco WIRE LINK FENCE WITHOUT TOP RAIL
Fence 7 ft. high over all, one of several enclosing the New York State Barge Canal Terminals.
This type is most unclimbable, because it gives no steady hand hold. But where the greatest strain resistance is required the Type 1103 is recommended.



DETAILS OF TYPE NO. 1103 AFco WIRE LINK FENCE

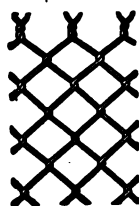
Showing method of bracing at ends. Standard stock heights 7 and 8 ft. Other heights up to 12 ft. can be furnished



DETAILS OF STRUCTURAL MEMBERS OF AFco WIRE LINK FENCE

Gates—Afco swing gates are made with tubular frames, acetylene-welded at all intersecting joints. Heavy offset hinges are furnished, which allow the gate to open flat against the fence. Non-freezing gate stops insure positive locking under all conditions. Locking device provides for both top and bottom fastening. Padlock attachment is so arranged that padlock is accessible from either side of fence; no chains required.

When conditions do not permit the use of swinging gates, a counterbalanced sliding gate can be furnished in any width up to 14 ft. single, or 28 ft. double.

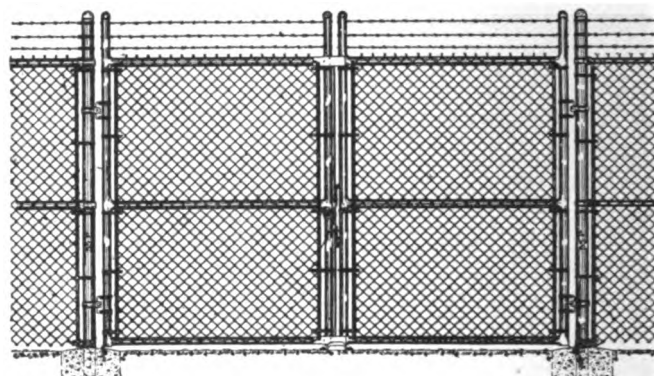


DETAIL OF WIRE LINK FABRIC

Specification Data Afco Factory Fence

Posts—End, corner and gate posts (up to 16 ft. openings) 3-in. outside diameter. Gate posts for openings 18 ft. or over, 4-in. outside diameter wrought pipe with horizontal pipe braces and 2-ply No. 7 galvanized wire truss cables.

Line posts Afco 1-piece angle, with integral arm, to be standard spacing 8 ft. apart (10 ft. spacing can be provided), set 3 ft. below grade. Galvanized or painted.



DETAILS OF AFco SWINGING GATE

Frames are 1½-in. tubular, all joints acetylene-welded. Adjustable hinges to allow for full swing. Locking device and center stop. Standard sizes: single, 4, 6, 8 and 10 ft.; double, 12, 14, 16, 18 and 20 ft.

Top Rail—Tubular 1½-in. outside diameter wrought pipe. When desired a 1½-in. rail can be substituted and line posts spaced 10 ft. instead of 8 ft. apart—8-ft. spacing recommended. Fences without top rail to have two courses of No. 7 coiled steel supporting wires stretched top and bottom.

Gates—Single swing, 4, 6, 8 and 10 ft.; double swing, 12, 14, 16, 18 and 20 ft. (greater widths are special). Frames are 1 9/10 in. tubular, all joints welded. For counterbalanced sliding types, see detail at bottom of page.

Fabric—Afco galvanized wire link, 2 in. mesh, No. 9 or No. 6 wire (No. 6 recommended for severer services). [Give height or size of mesh.]

Barbed wire overhang 4-point, thick-set galvanized, three or more courses.

Galvanizing—All posts and their fittings to be hot dip galvanized after fabrication.

Galvanized bolts to be used in assembling. (Threads not recut.)

Painting—When galvanizing is not specified for frame-work, paint 1 shop coat, also 1 field coat before galvanized wire fabric is attached.

Erecting—Set all posts in concrete footings (ordinarily 3 ft. deep); area for end, corner and gate posts not less than 15 in. in diameter, and for line posts not less than 10 in.

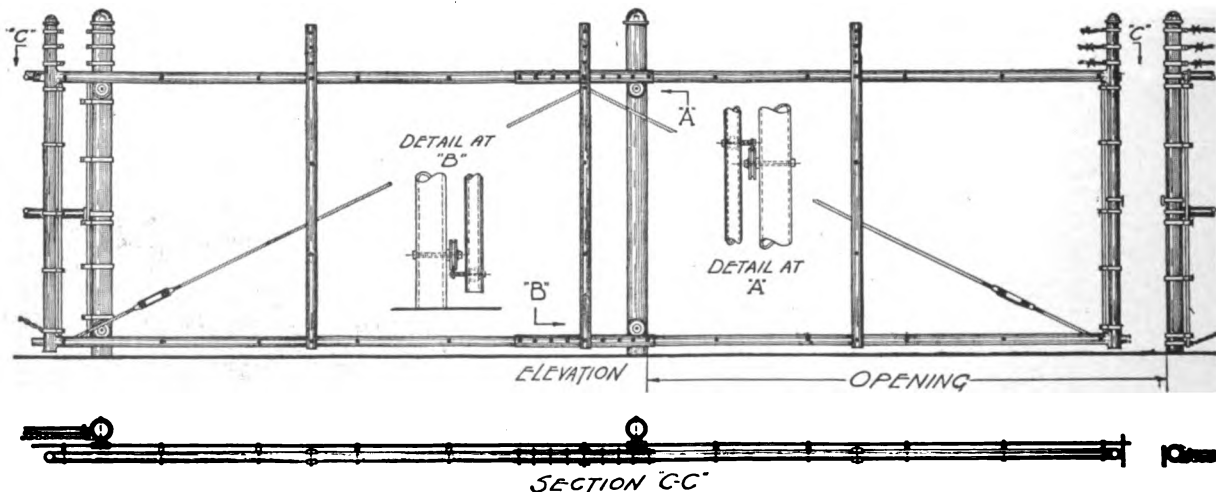
Notable Afco Factory Fence Installations

The Afco organization is national in its scope, having furnished and erected industrial fences for such concerns as:

Standard Oil Co.
Armour & Co.
The Barrett Co.
Crucible Steel Co.

American Cotton Oil Co.
Mexican Petroleum Co.
International Paper Co.
Standard Sanitary Mfg. Co.

A list of the leading users of Afco fence will be sent to any one on request.



DETAILS OF COUNTER-BALANCED SLIDING GATE

Frame is 1½-in. tubular with welded corners. Gate is operated on four rollers attached to adjacent posts as shown. Opens half its length. Made in single widths up to 14-ft. opening, double widths up to 28-ft. opening. Designed to overcome the use of overhead track and supporting structure. Operates with great ease—can not get out of order

Afco Wrought Iron Fences and Gates

Illustrations show the three leading types of wrought iron fences and gates designed by this company for factory enclosures.

Afco factory fence catalogue showing various other designs, also methods of installation, and containing much valuable information, will be mailed on request.

No. 325 Special Iron Picket Fence

In connection with simplicity and great strength, this design incorporates low erection cost by virtue of the panels being made in 10-ft., instead of the ordinary 8-ft. lengths. This reduces, by 20%, the number of holes to dig, posts to set and panels to hang.

Specifications—Pickets $\frac{3}{4}$ -, $\frac{7}{8}$ -, or 1-in. square wrought iron. Rails $2 \times 2 \times \frac{1}{4}$ -in. angles, or $2 \times 1 \times \frac{1}{8}$ -in. channels. Line posts 3-in. I-beam, $5 \frac{1}{2}$ -lb. section for heights up to 6 ft.; $7 \frac{1}{2}$ -lb. section for greater heights. No back bracing required with these posts. Posts set 18 in. into concrete footings which extend not less than 36 in. below grade. Panels 10 ft. long equipped with heavy center supports.

No. 152 Iron Picket Fence

Similar in general to design shown on top of page, except that in this fence there are 3 horizontal rails. In the installation pictured the entire work stands on a concrete coping. Line posts enter concrete 12 in.

Angle Picket Railing

The vertical members in this design are high carbon steel angles instead of solid bars, making a difference of about 25% in weight with a consequent reduction in cost. This reduction in weight makes it practical to rust-proof this type of fence by hot dip galvanizing in panels after fabrication. No painting is then required.

Specifications—Pickets $1 \times 1 \times \frac{1}{8}$ -in. angles on 5-in. centers, or $1 \frac{1}{4} \times 1 \frac{1}{4} \times \frac{1}{8}$ -in. on 6-in. centers. Rails $2 \times 2 \times \frac{1}{8}$ -in. angles. Line posts, regular adjustable picket post with back supporting brace and cast iron ground base, or 3-in. standard I-beam section to set in concrete. Panels 8 ft. long equipped with center supports.

Special Gates

Massive iron gates at the main factory entrance are decidedly attractive. They can be used in connection with wire as well as iron fence without greatly increasing the cost. The view shown herewith is a good example of what can be accomplished.

In this instance massive brick piers were used, ornamented at the top with specially designed lamps. Width of gates 20 ft. Height at center 7 ft. 6 in.

Note ornamental panel effect at center and on each side.

The extreme width of these gates was made necessary owing to the driveway entering at an acute angle.

Many other designs showing factory gate installations can be submitted.



NO. 325 WROUGHT IRON RAILING, 7 FT. HIGH

Posts are $7 \frac{1}{2}$ -lb. I-beam section set in concrete. Pickets $\frac{3}{4}$ -in. square, set diagonally. This fence can be furnished in all heights from 4 ft. up to 8 ft.



NO. 152 IRON PICKET FENCE, 6 FT. HIGH, ENCLOSING PLANT OF THE CROWN MFG. CO., PAWTUCKET, R. I.

Pickets $\frac{3}{4}$ -in. square, set square. Horizontal rails $2 \times \frac{3}{8}$ -in. solid. Posts are $5 \frac{1}{2}$ -lb. I-beam section, ornamented with pineapple heads.



ANGLE PICKET FENCE AND GATES, 6 FT. HIGH, ENCLOSING PECK MEMORIAL HOSPITAL GROUNDS, BROOKLYN, N. Y.

At a distance of only a few feet this fence has the appearance of an unusually massive solid picket fence.



SPECIALLY DESIGNED WROUGHT IRON FACTORY ENTRANCE GATES, MAIN DRIVEWAY ENTRANCE TO BAER BROTHERS PLANT, STAMFORD, CONN.

ANCHOR POST IRON WORKS

Manufacturers of Wire Fences, Iron Railings and Entrance Gates

OFFICES AND SALESROOMS

TELEPHONE

CORTLANDT 4886-7-8-9

50 Church Street
NEW YORK, N. Y.

BRANCH SALES OFFICES

FACTORIES

GARWOOD, N. J.
CLEVELAND, OHIO

BOSTON, MASS., 79 Milk Street
HARTFORD, CONN., 902 Main Street
PHILADELPHIA, PA., Real Estate Trust Building
CHICAGO, ILL., 8 South Dearborn Street
DETROIT, MICH., Penobscot Building

CLEVELAND, OHIO, Guardian Building
PITTSBURGH, PA., 2011-13 Penn Avenue
ROCHESTER, N. Y., 1604 Main Street, East
MINEOLA, L. I., N. Y., Jericho Turnpike
CINCINNATI, OHIO, 141 Fourth Street

SALES AGENTS

ATLANTA, GA., BEAULIEU & APPLEWHITE, 1317 Third National Bank Building
BIRMINGHAM, ALA., C. S. CALDWELL, 2011 Third Avenue
DALLAS, TEX., SOUTHERN WIRE & IRON Co.
GREENVILLE, S. C., HENRY H. ORR, 315 Palmetto Building
KNOXVILLE, TENN., CHAS. M. ALLEN Co., 407 Burwell Building
LOS ANGELES, CAL., J. E. DWAN, 314 Citizen's Building
ST. LOUIS, MO., REINFORCED CONCRETE Co., Arcade Building

MINNEAPOLIS, MINN., JAS. J. KEHOK Co., 312 North Third Street
NEW ORLEANS, LA., J. T. MANN Co., Inc., 308 Tchoupitoulas Street
PORTLAND, ORE., THE MERRILL Co., Chamber of Commerce Building
RICHMOND, VA., R. M. NOLTING, 119 Mutual Building
SAN FRANCISCO, CAL., RICHARD SPENCER, 932 Hearst Building
SAVANNAH, GA., CHAS. M. MACLEAN Co., Merchants National Bank Building
SEATTLE, WASH., F. T. CROWE & Co., 508 Westlake Avenue, North

Products

ANCHOR POST CHAIN LINK UNCLIMBABLE FENCES and GATES; WOVEN WIRE and SQUARE MESH FENCES; ANCHOR POSTS; ANCHOR-WELD RAILINGS and GATES for all locations.

Also Electric Weld Sliding Gates; Inter-track Fences; Standard Wire Partitions for Factory Interiors.

Engineering and Erecting Service

ANCHOR POST IRON WORKS have designed, manufactured and erected fences, railings and gates for industrial corporations, railroads, public works, etc. throughout the United States for many years. The experience thus acquired is offered for the solution of all fencing problems. At New York City and at branches and sales



TRADE-MARK

offices are maintained crews of men trained in the careful planning and erection of our products. When a customer prefers to do the erecting, tools and necessary instructions are furnished.

Information Required for Estimates

In writing for prices or ordering, draw a simple diagram showing length of fence lines; location of gates, corners and ends; width of gate openings, single and double. State whether ground is level or graded.

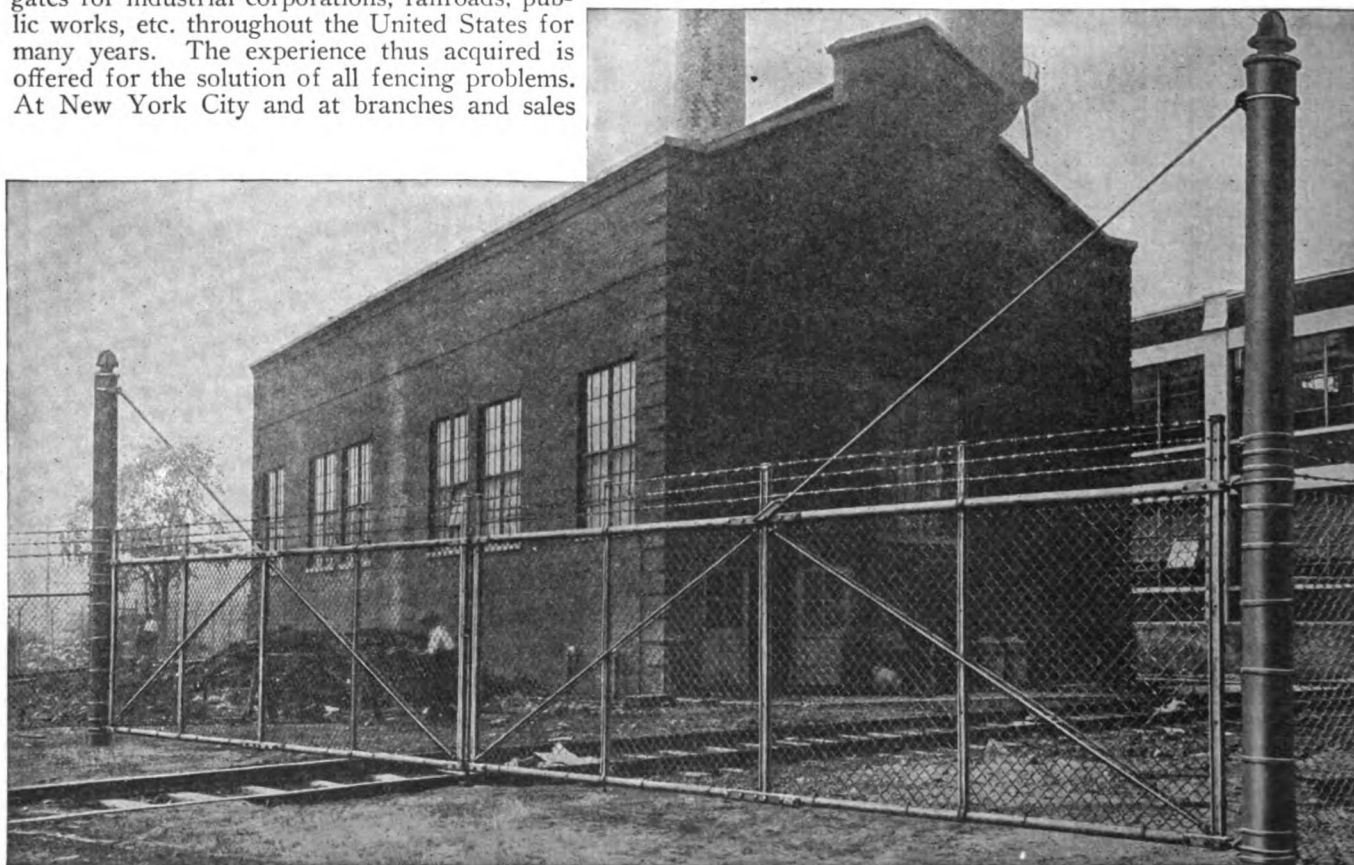


PLATE No. E3737. 2350 FEET OF STANDARD ANCHOR POST CHAIN LINK FENCE, INCLUDING 40-FOOT OPENING TYPE "E" DOUBLE GATE, ERECTED FOR LEHN AND FINK, BLOOMFIELD, N. J.
Height, 7 ft. Galvanized Anchor posts. Fabric, 2-in. mesh chain link woven steel; No. 6 gauge wire

Anchor Posts

Anchor posts are U-bars of high carbon steel and, together with all other parts, are heavily galvanized above and below ground, preventing rust and insuring long service. Posts are driven into the ground and held rigidly erect by two anchor stakes driven through slots clamped to opposite sides of the posts.

Chain Link Woven Steel Fences

Chain link woven steel is of the best quality galvanized steel wire of No. 9 or No. 6 gauge, No. 6 being the size most used. Made in any width up to 10 ft. The mesh is so small it affords no foothold for fence climbers; and as an additional protection 3 strands of barbed wire are fastened to inwardly inclined arms attached to the tops of posts.

Fence is furnished with or without top rail of galvanized pipe. Posts and all fence parts are galvanized by hot dip spelter process. Under conditions where protection is of utmost importance, these fences are made 10 ft. in height, and diagonal arms and barbed wire are attached to both front and back of posts; the spread across the top is about 2 ft. The gates are as unclimbable as the fence.

Square Mesh Fences

To meet conditions which do not demand the heavier chain link fence, this company builds an unclimbable fence of moderate cost but of great strength and durability.

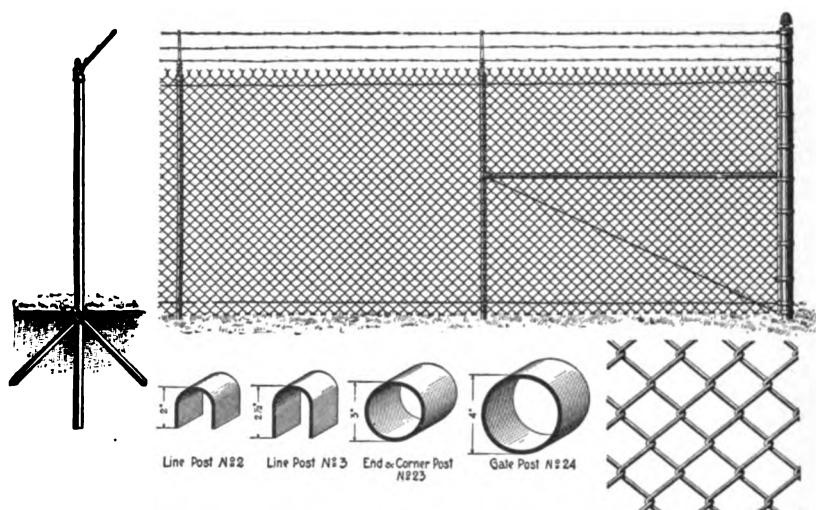
The posts are regular Anchor posts, size C, set 8 to 10 ft. apart. Fence is made in heights from 4 ft. up to 8 ft. Square mesh fabric is of No. 9 galvanized wire, the upright wires being 6 in. apart. Inclined inward from the post tops are steel arms, on which are stretched three strands of barbed wire. Posts, fittings and fabric are thickly galvanized.

Chain Link Gates with Electric Weld Frames

Rigidity and strength are the most important characteristics of these gates. Their great strength is secured by joining the top and bottom rails, of 2 $\frac{3}{8}$ -in. galvanized pipe, to double uprights of 2-in. channel by means of channel corner plates *electrically welded* to the uprights. The corners so formed are fused together into a single absolutely unbreakable and unbendable piece.

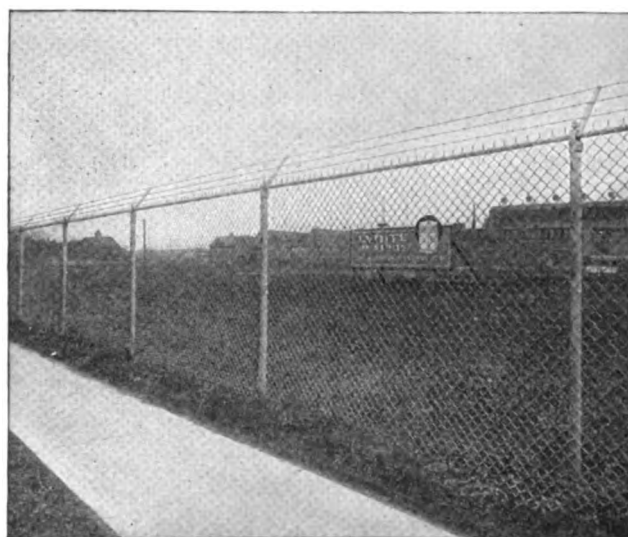
The center lift rod holds the gates at both the top and bottom. The padlock can be reached equally well from either the inside or outside of the gate. The hinges are of extra strong malleable iron and so made that the gate can be swung open 180° or back parallel to the fence line, a feature which is sometimes of the utmost importance, especially on railroad sidings.

Another exclusive feature of this gate is the method by which the chain link panel is fastened between the channel uprights and stretched up taut by means of hook bolts.



TYPE DOA-1. DREADNAUGHT STOCKADE

Fabric.....	Chain link woven steel; No. 6 gauge wire
Line posts.....	Galvanized Anchor posts, size D, 2 $\frac{1}{2}$ -in. steel U-bar, set 8 ft. on centers
End and corner posts.....	3-in. steel pipe
Gate posts.....	4-in. steel pipe



TYPE DTA-1. DREADNAUGHT STOCKADE WITH TOP RAIL

Height.....	8 ft.
Fabric.....	Chain link steel; No. 6 gauge galvanized wire

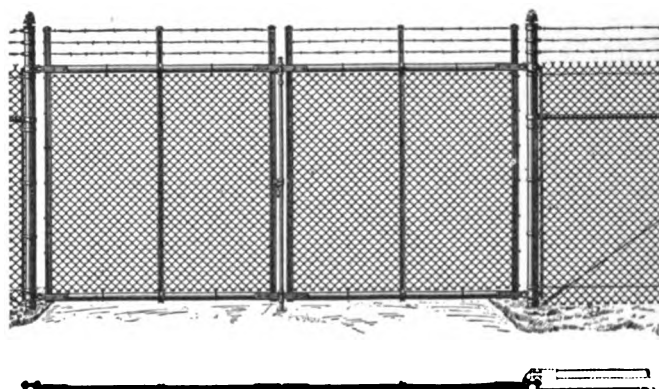
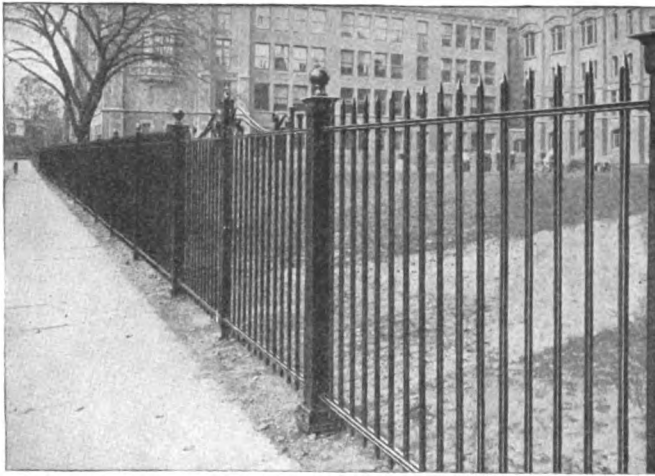


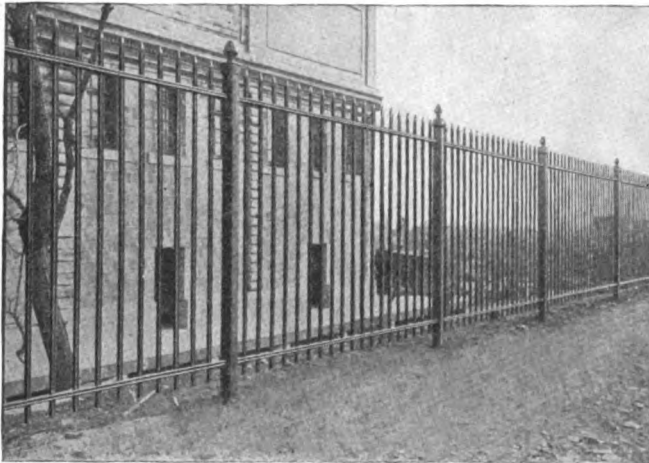
PLATE NO. E3648. ELECTRIC WELD SWINGING GATE

Frames made with electric weld uprights and corner pieces. Standard gates made in height to match fence. Single gates, 4 to 20 ft. between gate posts; double gates, 8 to 40 ft. and larger



ANCHOR-WELD RAILING AND TYPE RA3 GATE ERECTED FOR THE
HARTFORD PUBLIC HIGH SCHOOL, HARTFORD, CONN.

Height.....6 ft.
Pickets..... $\frac{3}{4}$ -in. grooved square
Rails..... $\frac{3}{4}$ -in. grooved square double rails
Posts.....3-in. I-beam, set with drive anchors
Panels.....Standard length, 10 ft.; height, 6, 7 or 8 ft.



TYPE RA3 ANCHOR-WELD RAILING SURROUNDING PLANT OF
STOLLWERCK CHOCOLATE CO., STAMFORD, CONN.

Height.....6 ft.
Pickets..... $\frac{3}{4}$ -in. grooved square
Rails..... $\frac{3}{4}$ -in. grooved square double rails
Posts.....3-in. I-beam
Panels.....Standard length, 10 ft.
Length.....812 ft.



TYPE GD2-1 ANCHOR-WELD DOUBLE GATES AT THE FACTORY OF
THE DURATEX COMPANY, NEWARK, N. J.

Anchor-Weld Railings and Gates

ANCHOR POST IRON WORKS has secured the rights of manufacture, and has installed the necessary electrical machinery for the welding of railings and gates of every size and weight, from those made of light iron bars of $\frac{1}{2}$ -, $\frac{5}{8}$ -, and $\frac{3}{4}$ -in. square.

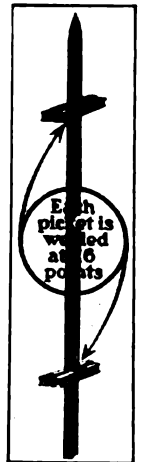
By this process, the rails, pickets or other members are welded together at all points of intersection under a heavy electrical current, combined with a mechanical pressure of from 1 to 5 tons exerted at the moment the weld is made. This insures an absolute and unbreakable union of the metal of both the pickets and the rails.

Railings and gates made in this way are remarkably strong and rigid. Each unit, that is, each panel of railing, or each gate, being welded into practically one piece of metal, is free from weak joints or rivets.

The rails and pickets are rolled grooved square rods of open hearth steel. Placed so that their grooves cross one another (a picket between two rails) results in a distinct weld at each point of flange contact. Thus in the simplest form of Anchor-Weld railing (one double top rail and one double bottom rail) each picket is welded at 16 points.

The grooved square rods are in themselves an ornament, but the addition of an extra rail at top or bottom or the introduction of scrolls, circles or other decorations, make this type of railing or gate entirely suitable for even the most elaborate surroundings.

A copy of our catalogue on this type of railing will be sent on request.



EACH PICKET
IS WELDED
AT 16 POINTS

Anchor-Weld Gates

These gates are made to match the railing; the rails and pickets being the same as in the railings.

The gates are hung on strong, malleable iron hinges; and are equipped with drop bolt in the center, hasp and padlock.

The gate posts are our standard posts No. 100 or No. 200, 3- or 4-in. square, respectively, also Anchor Post 3-in. I-beams.

These posts are usually set in concrete or anchored.



TYPE GD2 OR 3-1 ANCHOR-WELD DOUBLE GATE, PICKETS $\frac{5}{8}$ - OR
 $\frac{3}{4}$ -IN. GROOVED SQUARE

CINCINNATI IRON FENCE COMPANY

3325 Spring Grove Avenue

CINCINNATI, OHIO

Product

IRON FENCING.

For Folding Gates and Door and Window Guards, see page 370.

Service

When requesting prices, time and delay will be saved if a diagram of the grounds is supplied, specifying the number of feet and gates required. If this company is advised for what purpose the iron fence is wanted, they can suggest suitable designs to suit requirements.

Any ordinary mechanic can erect Cincinnati fence, as full instructions are furnished with each order.

Experience and Facilities

This company has been established in business for 26 years and has built up an enviable reputation for quality of products and workmanship.

The company has one of the most complete fencing factories in the United States and its unsurpassed facilities, together with its extensive experience, assure purchasers of strictly high grade work for quick delivery at reasonable prices.

Cincinnati Iron Fencing

The CINCINNATI IRON FENCE COMPANY offers to the industrial field the most durable fencing made.

Cincinnati iron fencing will last indefinitely and from the standpoint of economy, it is much cheaper than wooden fencing. It is built in panels and is very easy to set, complete instructions for erecting being furnished with each order. Expansion and contraction of panels have been provided for and construction throughout is mechanically correct.

In addition to the standard iron fencing illustrated below, this company will build fencing in accordance with purchasers' designs or specifications.

Fencing is furnished complete with one coat of black paint, line posts, braces, center supports under each panel and bolts. Gates and gate posts, end and corner posts are charged for extra, and measured in line of fence. Blue prints sent on request.

Specifications

Channel Rails— $1\frac{1}{2} \times \frac{1}{2} \times \frac{3}{16}$ -in. rails used with $\frac{5}{8}$ -in. round or square pickets. Rails $2 \times \frac{5}{8} \times \frac{3}{16}$ in. used with $\frac{3}{4}$ -in. round or square pickets.

Pickets—Fence made with $\frac{5}{8}$ -in. or $\frac{3}{4}$ -in. round or square pickets makes a very strong and substantial fence. All pickets are securely calked in the rails.

Line Posts—Line posts are made of 1-in. square solid steel with $4 \times 4 \times \frac{1}{4}$ -in. plate on the bottom, set 2 ft. 6 in. in the ground.

Braces—Braces are made of $\frac{5}{8}$ -in. round with $3 \times 3 \times \frac{3}{8}$ -in. plate on bottom, set 2 ft. 6 in. in ground.

Center Supports—Center supports are made of $\frac{5}{8}$ -in. round with $2\frac{1}{2} \times 3$ -in. plate on bottom placed in the center of every 8-ft. panel.

Connections—All connections and picket tops are made of the best malleable iron.

Gates and Gate Posts—All gates are made to match the design of fence selected.

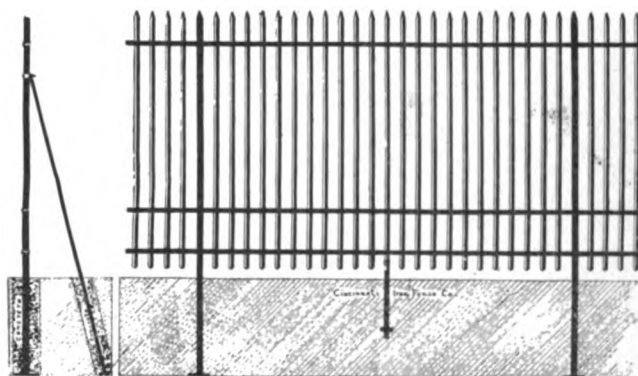
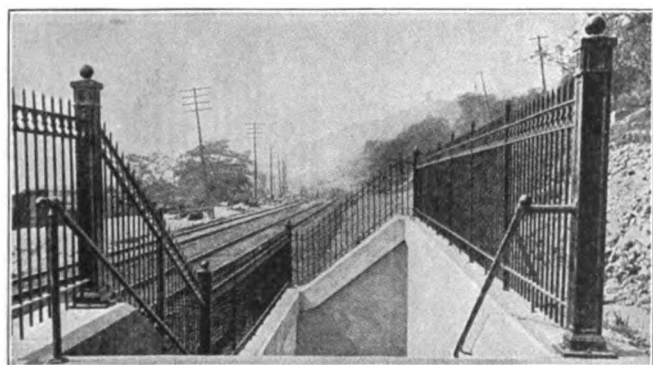
Standard size walk gates are 3 ft. 2 in. wide between posts.

Standard size drive gates are 8 ft. 6 in. wide between posts.

Cast iron gate posts make a very attractive entrance. Wrought iron or tubing posts can also be furnished.

Directions for Taking Measurements of Fence

Always face the lot when taking measurements. Begin at one corner of the lot and measure from center to center of gates. Also specify the grade in the ground if it is not level.



STANDARD CINCINNATI IRON FENCING

These designs can be made in any height or with any size pickets desired

Blue prints furnished on application

Orders given prompt attention

CYCLONE FENCE COMPANY

Manufacturers of Fencing and Gates in Wire and Iron

GENERAL OFFICES
WAUKEGAN, ILL.

FACTORIES: WAUKEGAN, ILL.; CLEVELAND, OHIO; FORT WORTH, TEX.

BRANCH OFFICES

CHICAGO, ILL., New York Life Building
ST. PAUL, MINN., 2401 University Avenue
INDIANAPOLIS, IND., 431 Merchants Bank Building
DETROIT, MICH., 1247 Washington Boulevard
BUFFALO, N. Y., 45 Builders Exchange Building
PHILADELPHIA, PA., 403 Stock Exchange Building
PITTSBURGH, PA., 835 Oliver Building

NEW YORK, N. Y., 2787-89 Woolworth Building
BALTIMORE, MD., 15 East Fayette Street
ATLANTA, GA., 920 Healey Building
OAKLAND, CAL., 310 Twelfth Street
PORTLAND, ORE., 52-54 Union Avenue
SAN FRANCISCO, CAL., 245 Market Street
LOS ANGELES, CAL., 320 North Los Angeles Street

Products

CYCLONE PROPERTY PROTECTION STEEL FENCING AND GATES for industrial plants of all kinds, shipyards, and waterfront properties, textile mills, tank farms and oil refineries, chemical plants, industrial housing communities, city power and pumping stations, filtration plants, reservoirs, etc.

FENCING for city, county, state and national institutions, parks, cemeteries, public and private grounds, fair grounds, country estates, country clubs, tennis courts, public and industrial playgrounds, kennels, animal cages, bird cages, etc.

SPECIAL FENCING and ENTRANCE GATES, Wire or Iron, built for any purpose.

SWINGING, SLIDING and FOLDING GATES, IRON RAILINGS, etc.

WIRE WORK of all kinds: Wire Partitions (built-in-sections) for factory departments, offices, stock-rooms, etc., Window and Skylight Guards, Woven Wire Display Signs, Wire Conveyor Belting.

Cyclone Service

The expert engineers of this company will solve all fencing problems such as rolling land, steep grades, ravines, switch tracks, etc.



TRADE-MARK

Blue prints showing details of Cyclone Fence construction, sent free on request.

Special construction salesman will call, measure property, show samples of fence and photographs of completed jobs.

When desired, expert construction superintendent is furnished at nominal charge to superintend erection of fencing anywhere.

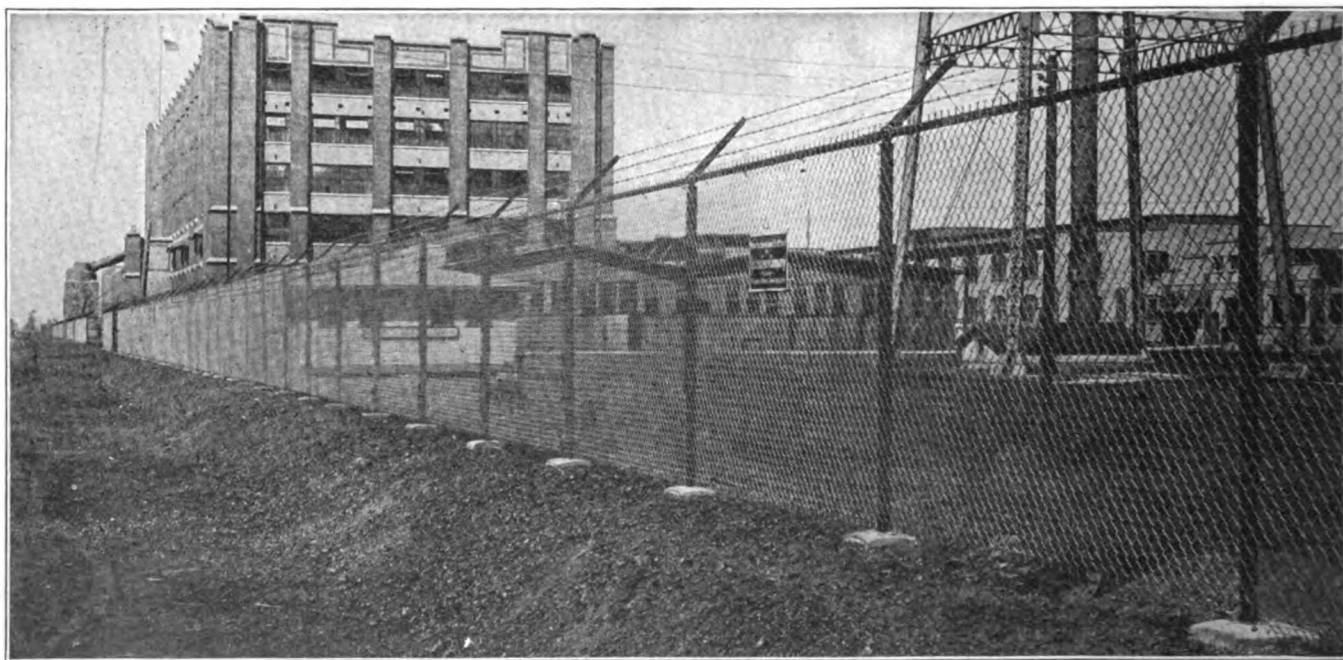
Cyclone Standard Construction

Specifies full standard weight tubular steel for posts and rail. The outside diameter size, also weight per lineal foot of posts and top rail are specified. Figures are taken from full standard weight schedule adopted by manufacturers. It is recommended that all posts be set in concrete and that Cyclone standard specifications be used to insure maximum satisfactory service.

When Cyclone standard fence construction represents a greater investment than conditions would warrant, a lighter weight post construction is provided to suit any requirement.

Chain Link Invincible Fence Specifications

Fabric—Made in all sizes of wire from No. 4 to No. 12 gauge. Woven in various sizes of mesh, in any height desired. Top and bottom selvages have *twisted* and *barbed* finish.



CYCLONE CHAIN LINK INVINCIBLE FENCING

Posts—Full standard weight tubular steel. Line posts set 30 in. in ground; end, gate and corner posts, 36 in. in ground. Line posts spaced not over 10 ft. apart.

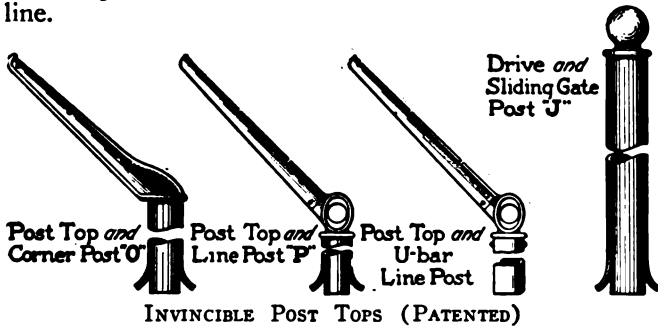
End and corner posts "O," also walk gate posts "J," 3 in. outside diameter, weight, 5.79 lbs. per lin. ft. Single swing drive gate posts "J," for gates up to but not including 10-ft. opening, also double swing drive gates up to but not including 20-ft. opening, 3½ in. outside diameter, weight, 7.58 lbs. per lin. ft.

Posts for single swing drive gates 10 ft. and over, also double swing drive gates 20 ft. and over, and slide gates of all opening sizes, 4 in. outside diameter, weight, 9.1 lbs. per lin. ft. Line posts "P," 2½ in. outside diameter, weight, 3.65 lbs. per lin. ft.

Note—All weights and dimensions are nominal, and are taken from the full standard weight schedule adopted by manufacturers. The permissible variation in specifications is 5% either way.

When desired, U-bar high carbon steel line posts are furnished instead of tubular steel line posts. U-bar posts are 2½ in., weight, 3.60 lbs. per lin. ft.

Post Tops—Patented; made of pressed steel arms securely riveted to heavy malleable iron base, and carry three 4-point barbed wires, 12 in. in or out from fence line.



Top Rail and Braces—Tubular steel, 1½ in. outside diameter, weight, 2.27 lbs. per lin. ft. Top rail provided with sliding expansion joint (patent applied for) that allows for expansion and contraction of top rail due to atmospheric changes.

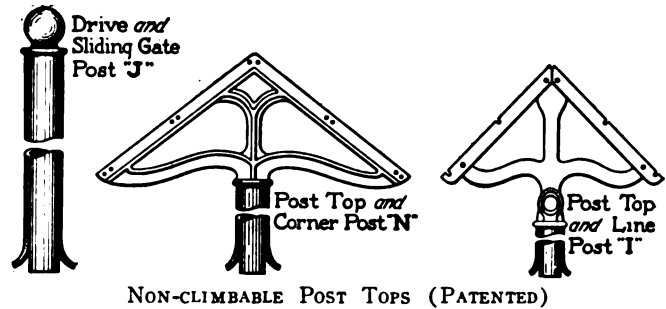
Galvanized or Painted—Furnished all heavily galvanized, or with galvanized fabric and painted framework.

Chain Link Non-climbable Fence Specifications

Posts—Full standard weight tubular steel. Line posts provided to set 30 in. in ground; end, gate and corner posts, 36 in. in ground. Posts to be spaced in line of fence not over 10 ft. apart.

End and corner posts "N," also walk gate posts "J," 3 in. outside diameter, weight, 5.79 lbs. per lin. ft. Single swing drive gate posts "J," for gates up to but not in-

cluding 10-ft. opening, also double swing drive gates up to but not including 20-ft. opening, 3½ in. outside diameter, weight, 7.58 lbs. per lin. ft. Posts for single swing drive gates 10 ft. and over, also double swing drive gates 20 ft. and over, and slide gates of all opening sizes, 4 in. outside diameter, weight, 9.1 lbs. per lin. ft. Line posts "I," 2½ in. outside diameter, weight, 3.65 lbs. per lin. ft.



Post Tops—Patented; made of pressed steel arms securely riveted to heavy malleable iron base, and carry five 4-point barbed wires 9½ in. in and out from fence line.

Chain Link Safeguard Fence Specifications

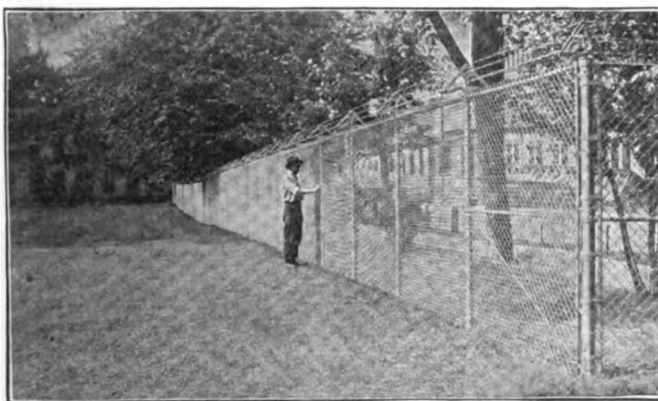
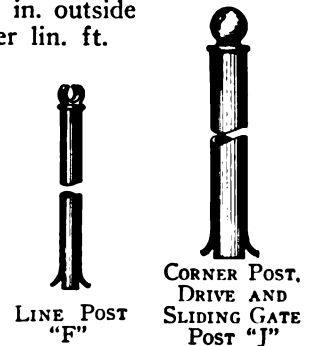
Especially recommended for schools, playgrounds, athletic grounds, country estates, parks, cemeteries, etc.; also industrial plants of all kinds. A row of protecting barbs projects above top rail, or fence is furnished with smooth knuckled selvage in place of barbs.

Posts—Full standard weight tubular steel. Line posts set 30 in. in ground; end, gate and corner posts, 36 in. in ground. Posts spaced in line of fence not over 10 ft. apart.

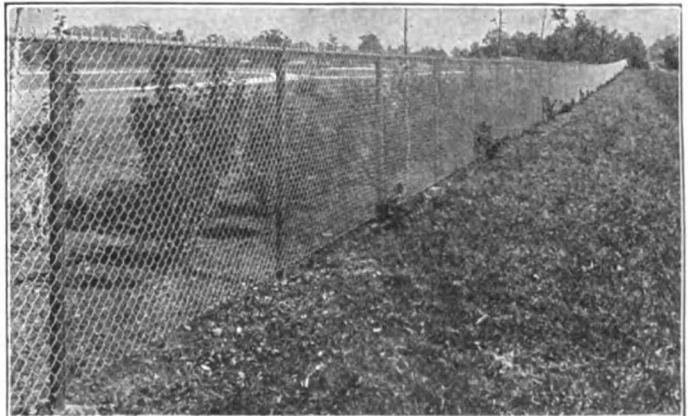
End, corner and walk gate posts "J," 3 in. outside diameter, weight, 5.79 lbs. per lin. ft. Single swing drive gate posts "J," for gates up to but not including 10-ft. opening, also double swing drive gates up to but not including 20-ft. opening, 3½ in. outside diameter, weight, 7.58 lbs. per lin. ft.

Posts for single swing drive gates 10 ft. and over, also double swing drive gates 20 ft. and over, and slide gates of all opening sizes, 4 in. outside diameter, weight, 9.1 lbs. per lin. ft.

Line posts "F," 2½ in. outside diameter, weight, 3.65 lbs. per lin. ft.



CHAIN LINK NON-CLIMBABLE FENCE



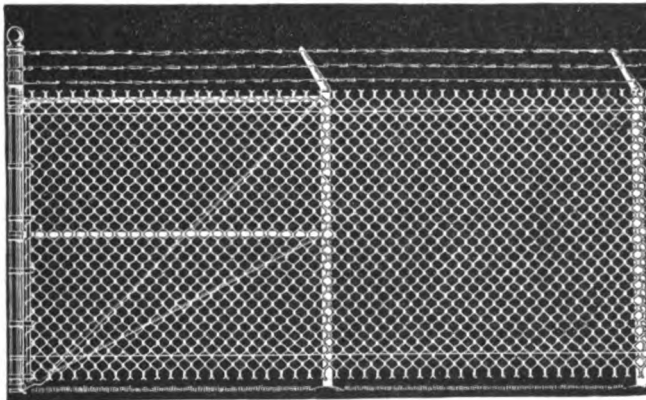
CHAIN LINK SAFEGUARD FENCE

Chain Link Reliance No. 1 Fence Specifications

Fabric—Made 6 ft. high of No. 9 gauge heavily galvanized wire woven into a 2-in. mesh. Top and bottom selvages of fabric have a *twisted* and *barbed* finish. Total height of fence, 7 ft.

Posts—End, walk gate and corner posts, standard, full weight tubular steel, 3-in. outside diameter, weight, 5.79 lbs. per lin. ft. Posts for single swing drive gates, up to but not including 10-ft. opening, also double swing drive gates, up to but not including 20-ft. opening, standard, full weight tubular steel, 3½ in. outside diameter, weight, 7.58 lbs. per lin. ft. Posts for single swing drive gates 10 ft. and over, also double swing drive gates 20 ft. and over, and slide gates of all opening sizes, standard, full weight tubular steel, 4 in. outside diameter, weight, 9.1 lbs. per lin. ft.

Intermediate posts of heavy high carbon steel specially rolled U-shape 2½ in. wide, weight, 3.60 lbs. per lin. ft. and spaced 12 ft. apart. Braces are heavy steel tubing 1⅝ in. outside diameter, weight, 2.27 lbs. per lin. ft. Post tops, same as used on Invincible fence.



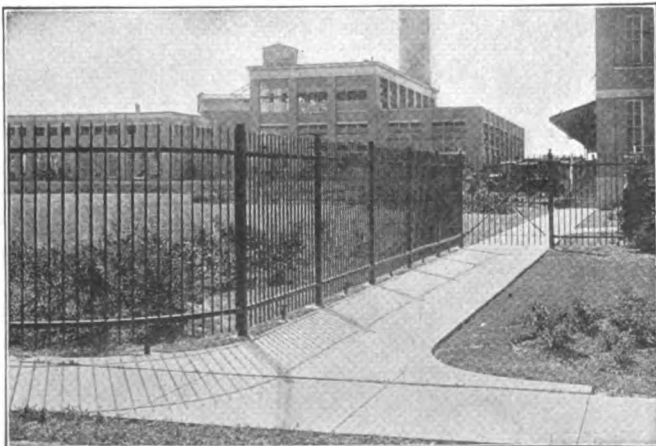
CHAIN LINK RELIANCE No. 1 FENCE

Gates

Made in any height for any opening size, single or double drive, to match fence; also made in special designs. Swinging gates arranged to swing either way, to lock from either side. When desired, roller bearing sliding gates furnished to run on overhead enclosed steel track.

Iron Fences

Iron fencing and iron front entrance gates built and erected for any purpose. Purchasers' tastes can be incorporated in attractive designs that will harmonize with any architecture or landscape.



SOLID PICKET IRON FENCE

Prices, Information Required, etc.

Prices on fence job erected complete, or services of construction superintendent, quoted on application.

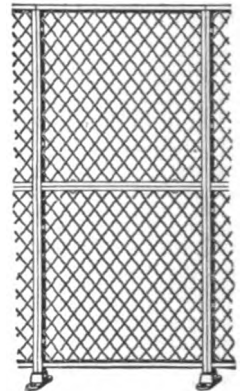
When writing, send a diagram or blue print of proposed fence lines, giving measurements of each stretch and total measurements. Make an "X" where corner, end or gate posts are to be placed. State whether single, double drive or sliding gates are wanted, and give opening size.

Quotation on complete job will follow by return mail.

Wire Work of All Kinds

(Built-in-Sections) Partitions

Built in standard size sections 4 ft. wide by 8 ft. high. Frames are 1-in. channel iron. Fabric is No. 10 gauge wire woven in 1½-in. diamond mesh. Furnished with either swinging or sliding gates. Handholes or wickets provided where needed. Floor flanges furnished for either wood or concrete floors. Sections are interchangeable, movable; can be taken out and used elsewhere—no refitting—no loss. Quick changes in departments can be made any time. Send blue print or layout of partition work wanted.



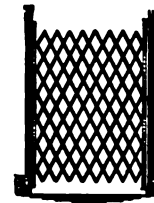
PARTITION SECTION

Window and Skylight Guards

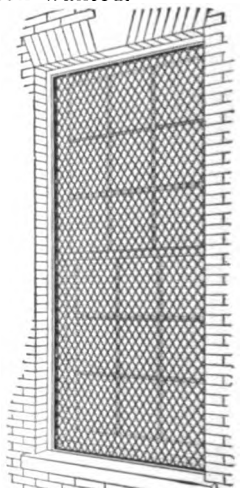
Frames are 1-in., or ¾-in. channel, or ⅜-in. round iron. Fabric is No. 10 gauge wire woven in 1½-in. diamond mesh.

Channel iron frames fit into openings. Round iron frames usually allow ¾ in. on all sides for lap. Special guards built with either channel or round iron frames, using size of wire and mesh desired.

Folding Gates—Built for any width or height. Take up minimum space. Fold out of way.



FOLDING GATE



DIAMOND MESH WINDOW GUARD

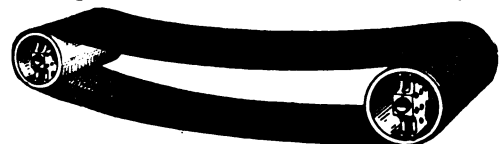
Woven Wire Signs—Built in any size with heavy channel iron frames. Letters of heavy galvanized sheet steel. All signs are constructed to withstand weather conditions and give permanent service. State length and height of sign wanted, also name to be displayed.



WOVEN WIRE SIGN

Woven Wire Conveyor Belts

Flat wire and chain link belts furnished in 1- and ½-in. mesh, any length, in standard widths of 18, 24 and 30 in. Special widths and mesh to suit requirements.



WIRE CONVEYOR BELT

ESTABLISHED 1858

J. W. FISKE IRON WORKS

Ornamental Iron, Brass, Bronze, Wire and Zinc Work

78-80 Park Place
NEW YORK, N. Y.**Products**

FISKE CLIMB-PROOF CHAIN-LINK FENCING and ENTRANCE GATES; MANHOLE FRAMES AND COVERS; CATCHBASINS.

Also manufacturers of Window Guards, Tool and Stock Room Enclosures, Folding Gates, Turnstiles.

Ornamental Lamp Standards, Wrought Iron Railing, Weathervanes, Stable Equipment for horses and cattle, etc.

Fiske Quality

The large number of installations throughout the length and breadth of the country—for Federal, state and municipal governments, leading commercial organizations, and private estates—covering many generations of service, all attest to Fiske quality.

Fiske Climb-proof Fencing

The fence is constructed of heavily galvanized chain-link wire fabric, galvanized *after*, not before, the fabric is woven, thus insuring complete rustproofing.

Fiske galvanized posts are set in concrete, which means exact alignment and no rusting at the ground line.

The gates for this fencing are rigidly constructed of T-iron, also galvanized *after*, not before, making. Filling of the gate is made of galvanized chain-link fabric.

Height of fence and size of mesh to suit requirements.

Fiske Erecting Service

Fiske maintains a corps of erecting experts and workers to set any kind of fencing, railing, gates, and stock-room enclosures, whose services are at the disposal of Fiske customers at reasonable cost. When Fiske service men do the work, Fiske assumes all the responsibility for results.

Fiske Catalogues

Booklets, folders, catalogues and other literature, covering every type of Fiske products, mailed on request. When writing, specify what products you are interested in.

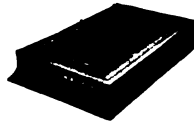


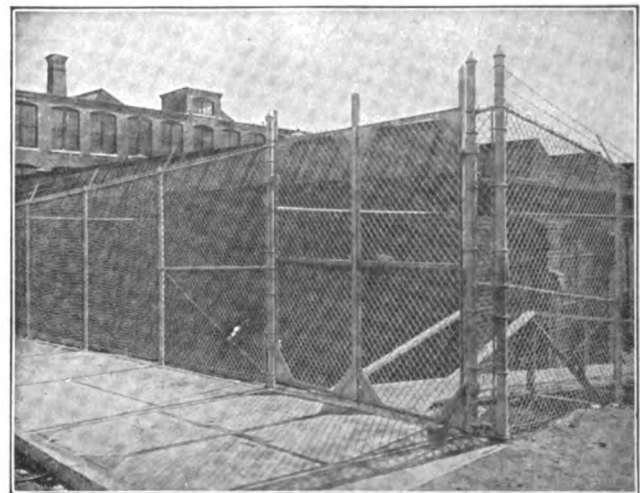
FIG. 161AK. GRATING AND FRAME
Heavy, 34 1/4 in. long, 19 in. wide on top, 6 in. deep



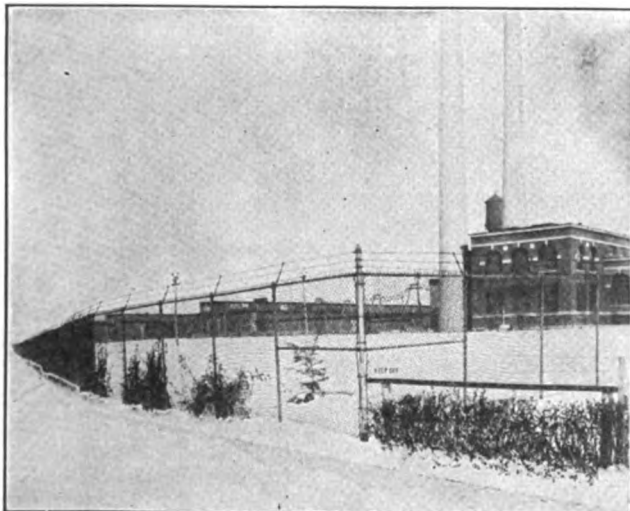
FIG. 163K. MANHOLE FRAME AND COVER
Top, 25 in. diam. Bottom, 36 in. diam., 9 in. deep.



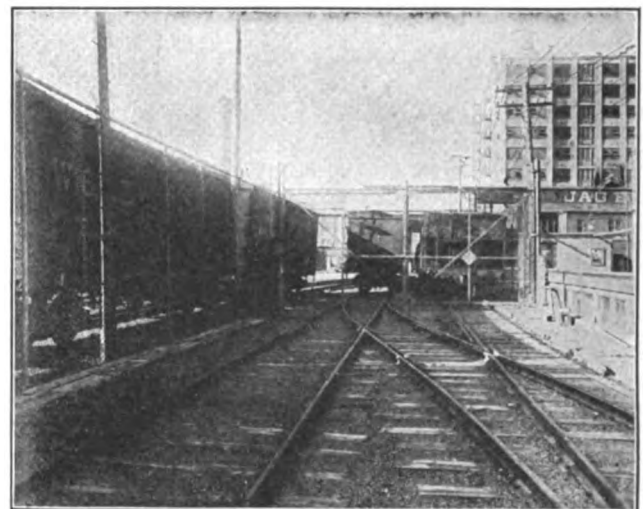
FIG. 162AK. CATCHBASIN INLET
Top 23x32 in. Bottom flange, 42 in. diam. Grating concave at rear



CHAIN-LINK FENCING FURNISHED AND ERECTED FOR THE MILLS
WOVEN CARTRIDGE BELT CO., WORCESTER, MASS.



CHAIN-LINK FENCING FURNISHED AND ERECTED FOR THE NEW
YORK AIR BRAKE CO., WATERTOWN, N. Y.



CHAIN-LINK FENCING 13 FT. HIGH, FURNISHED AND ERECTED
FOR THE REMINGTON ARMS, U. M. C. CO., HOBOKEN PLANT

PAGE STEEL AND WIRE COMPANY

Galvanized and Special Analysis Wire, Woven Wire Fabrics and Fencing

GENERAL SALES OFFICE
BRIDGEPORT, CONN.

DISTRICT SALES OFFICES

CHICAGO, ILL., 208 South La Salle Street
NEW YORK, N. Y., 1054 Grand Central Terminal

PITTSBURGH, PA., 644 Union Arcade Building
SAN FRANCISCO, CAL., 837 Pacific Building

PORTLAND, ORE., 422 Oregon Building

Products

PAGE PROTECTION (WIRE LINK) FABRIC for outside fencing, tennis courts, inside partitions and window guards.

WOVEN WIRE FABRICS for lawn and garden fence, farm fence; gates.

PAGE GATES.

Also, Galvanized Wire, Iron and Steel Wire, Rope Wire, Armco Wire, Special Analysis Wire, Barbed Wire, Welding Wire, Spring Wire, Wire Mill Products, and all kinds of Wire and Wire Work.

Exclusive Page Features

All Page wire is produced in Page wire mills. For 40 years Page chemists have been studying the grades of wire suitable for different woven wire fabrics.

By exclusive contract with the American Rolling Mill Co., any wire to be produced from Armco Ingot iron is made by the PAGE STEEL AND WIRE COMPANY. The Page Company is prepared to furnish any of its products in this pure rust resisting material.

Page Protection (Wire Link) Fences (Standardized)

On the right is shown a section of Page Protection fabric, with an enlarged detail of the weave. It will readily be seen that this construction gives the maximum of strength, as the pull in all directions can be equalized, and the resistance to stresses and strains of every nature is equally distributed.

Moreover, the fact that Page Protection fabric is all woven on Page looms and in Page factories, from wire rolled in Page mills, assures a uniformity of excellence that is unattainable under ordinary conditions of manufacture.

Page Economy and Protection Fence

Originally designed as an especially effective lawn and park fence, it has found considerable favor for industrial uses where first cost is a vital factor.

Economy and Protection fabric is up to Page standards of design and quality and for many needs is entirely suitable. It differs from Page wire link fabric, however, in that the latter was especially designed to fit industrial uses.

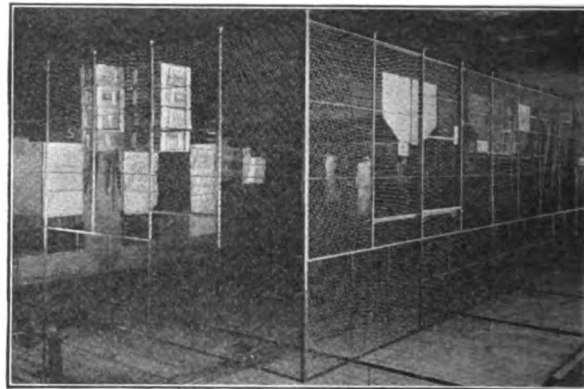
Economy and Protection fabric has a very wide range of service of its own. It emphasizes the comprehensiveness of the activities of the Page organization, which has so specialized in the design of wire fabric that it is not only able to supply a given type for a given service, but variations in design for variations in the service required.

Page Gates

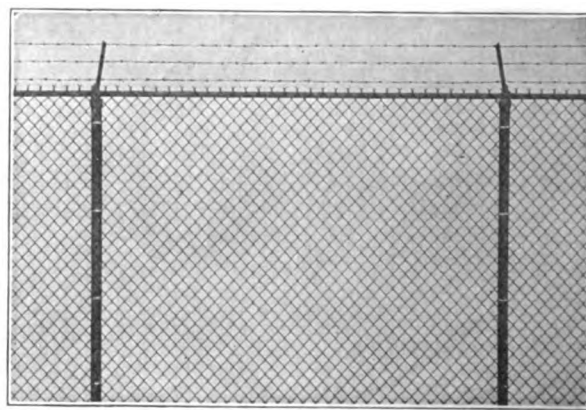
Page gate construction embodies an added factor of strength wherever stress and strain are greatest. The tubular steel posts are much larger than in the ordinary gate, and the bracing is considerably heavier.

Page gates stand the strain of constant use with the minimum amount of wear.

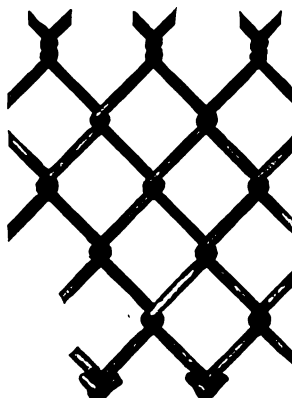
Several types of gates are made and it is possible with one of these types to secure practically any span desired, and to meet the conditions of any variety of approach.



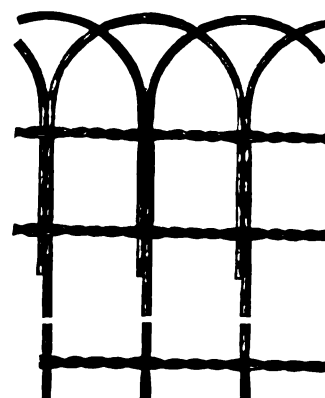
PAGE STANDARD WIRE LINK INSIDE PANEL PARTITION
Note self-supporting construction. No light is lost here.



PAGE PROTECTION (WIRE LINK) CONSTRUCTION WITH PIPE TOP RAIL AND PARTS



PAGE PROTECTION (WIRE LINK) FABRIC



PAGE ECONOMY AND PROTECTION FABRIC

WAYNE IRON WORKS

819 Commercial Trust Building

PHILADELPHIA, PA.

FACTORY: WAYNE, PA.

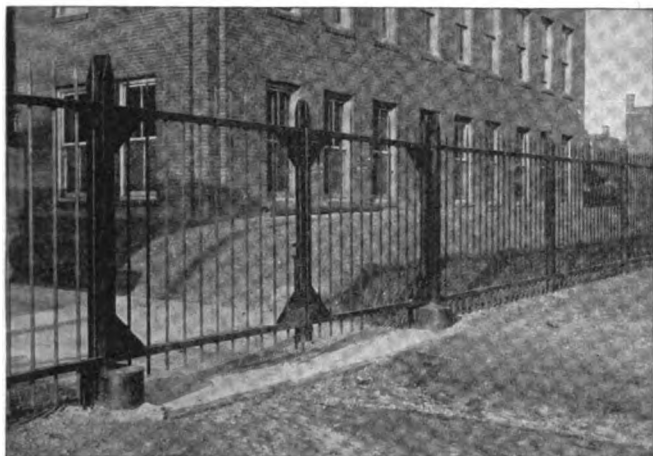
Products

IRON PICKET FENCE and GATES.

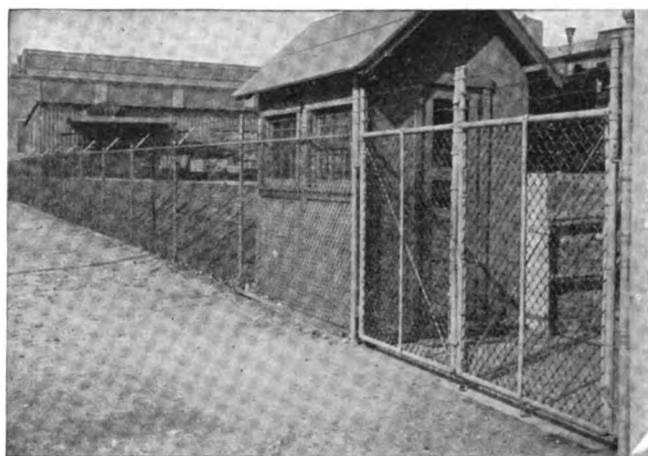
CHAIN LINK FENCE and GATES.

WAYNE SECTIONAL GRANDSTAND.

Also manufacturers of Railroad Intertrack Fence, Bridge Railings, Pipe Railings, Poultry Yards, Tennis Court Enclosures, Base Ball Backstops and Machinery Guards.



IRON PICKET FENCE AND GATE
Erected for Ferris Shoe Co., Philadelphia, Pa.



CHAIN LINK FENCE AND GATE
Erected for Edward G. Budd Manufacturing Co., Philadelphia, Pa.

Wayne Sectional Grandstand

The Wayne sectional grandstand is adaptable to any conditions. It can be set up as long or as high as surrounding conditions warrant.

Very durable, being constructed entirely of steel, except the board seats. There is nothing to wear out.

Made in standard interchangeable sections which fit together like a sectional bookcase.

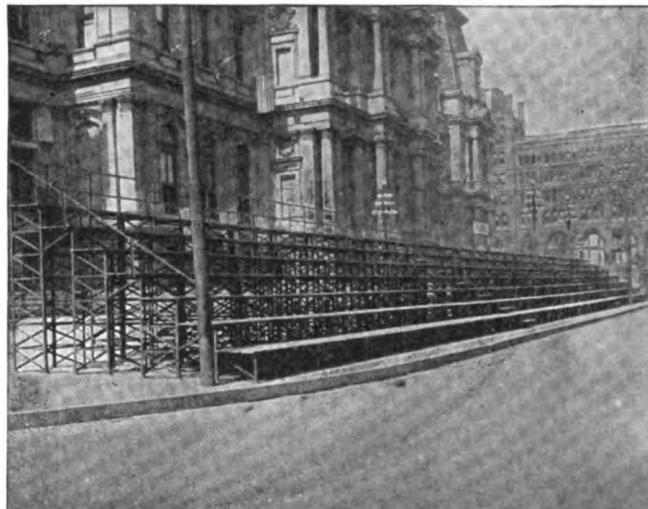
The sections fold flat for storage. No tools required to erect them. No bolts, screws, nails or pins used in erection. Dismantling causes no lost or waste material.

Approved by the Bureau of Building Inspection of Philadelphia.

The Wayne sectional grandstand is in constant use by many schools and cities.



Material for Grandstand, Folded



Completely Erected Grandstand

WAYNE SECTIONAL GRANDSTAND SEATING 1000 PERSONS, CITY HALL, PHILADELPHIA, PA.

Erected in one working day by a foreman and 8 unskilled laborers

CINCINNATI IRON FENCE COMPANY

Manufacturers of Iron and Wire Work

3325 Spring Grove Avenue
CINCINNATI, OHIO

Products

FOLDING GATES.
WINDOW and DOOR GUARDS.
IRON and WIRE WORK.
For Iron Fencing, see page 363.

Quality of Products

The widespread popularity of the CINCINNATI IRON FENCE COMPANY'S line of iron and wire work is the result of many years of experience, unsurpassed facilities, reasonable prices and strictly high grade work backed by a liberal guarantee.

Only the best materials are used; the workmanship is the very best obtainable and all products are smoothly and accurately finished.

This company invites rigid comparison of its products with those of other manufacturers and requests prospective purchasers to decide on merit alone.

Folding Gates

This company manufactures Bostwick and lattice type folding gates for all purposes.

The construction of these gates insures great strength and

lasting satisfaction. They are easily and noiselessly operated and fold compactly, thus permitting use of the entire opening.

Several standard types are shown herein which can be made in any height or width, thus it is necessary when ordering to specify the height desired and the size of the opening.

Window and Door Guards

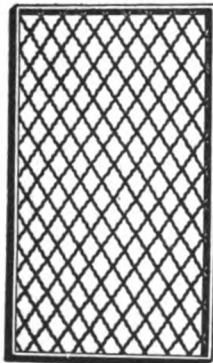
Window and door guards can be furnished in any size with either channel iron or round iron frames, with heavily galvanized steel wire, painted black. These guards can be furnished with hinges and hasps at additional cost.

Iron window guards with $\frac{1}{2}$ - or $\frac{5}{8}$ -in. pickets can also be furnished.

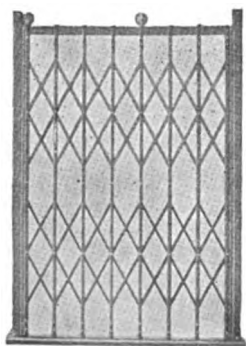
When ordering or writing for estimates, send diagram giving correct dimensions, and specify gauge of wire, size of mesh and style of frame.

Iron and Wire Work in General

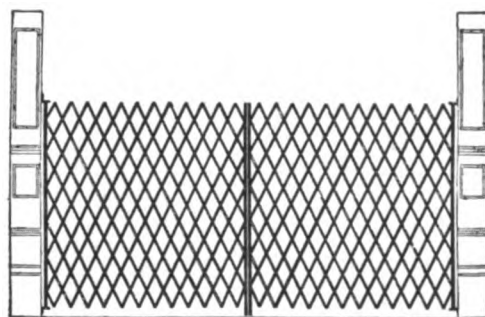
This company manufactures plain and ornamental iron and wire work of all kinds in accordance with any specifications.



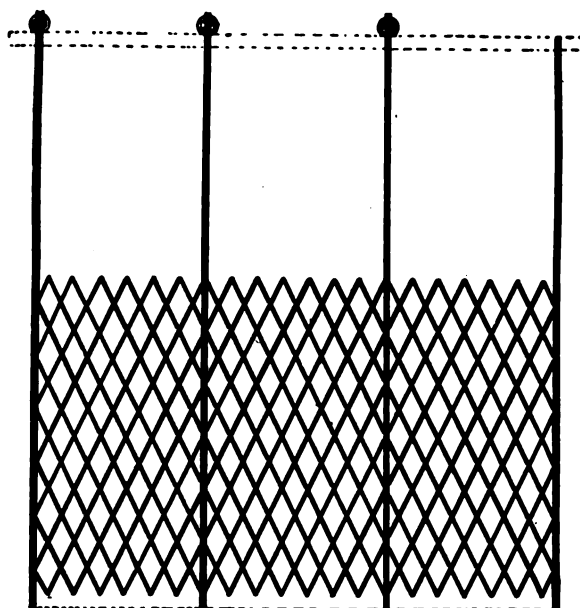
No. 1 STEEL WIRE
GUARD
With channel frame



No. 602 BOSTWICK TYPE
PASSENGER ELEVATOR GATE
Channel uprights, $\frac{5}{8}$ x $\frac{1}{2}$ in.; lattice, $\frac{1}{2}$ x $\frac{1}{2}$ in.



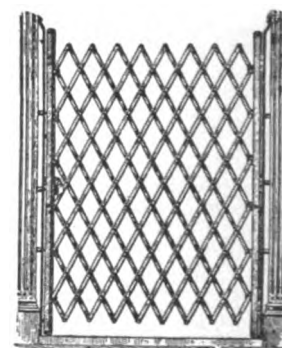
No. 600 DOUBLE FOLDING GATE
Same construction as No. 601



No. 599 SPECIAL TYPE FOLDING GATE
For freight elevators and large entrances of all kinds.
Channel uprights, $1\frac{1}{4}$ x $\frac{1}{2}$ x $\frac{1}{8}$ in.; lattice, $\frac{5}{8}$ x $\frac{1}{2}$ in.



No. 2 STEEL
WIRE GUARD
With round iron
frame



No. 601 SINGLE FOLDING
GATE
Side bars, $1\frac{1}{4}$ in.; lattice, $\frac{5}{8}$ x $\frac{1}{2}$ in.

AMERICAN WOOD PIPE COMPANY

EXECUTIVE OFFICES AND FACTORY
TACOMA, WASH.

BRANCH OFFICES AND MANAGERS

NEW YORK, N. Y., J. G. HEINZ, 30 Church Street
SALT LAKE CITY, UTAH, S. A. ROBERTS, Dooly Building

CHICAGO, ILL., A. J. BERGER, 140 South Dearborn Street
MISSOULA, MONT., C. F. FARMER, Smead Simons Building

Products

WIRE WOUND WOOD STAVE PIPE: (a) Douglas Fir natural stave with preservative coating. (b) Douglas Fir creosote impregnated staves (pressure treatment). (c) Douglas Fir creosoted or natural staves (burlap wrapped) "Anti-alkali." (d) Douglas Fir creosoted staves "Thin Shell" for low head requirements.

CONTINUOUS STAVE WOOD PIPE: (a) Douglas Fir Natural and creosoted staves.

Also manufacturers of Cedar Steam Pipe Casing, Wood Stave Tanks and Flumes.

Machine Banded Pipe

Manufactured in sizes 2 to 30 in. in diameter, and for all heads up to 600 ft. Staves of highest grade, close grained yellow Douglas Fir, finely machined to arc and radial lines, with longitudinal edge tongue and groove ("V" section tongue). Heavily galvanized steel wire is machine-wound under heavy tension on the stave cylinder, wire being spaced to take care of pressure head required. Ends of pipe are machined for: (a) mortise and tenon coupling, or

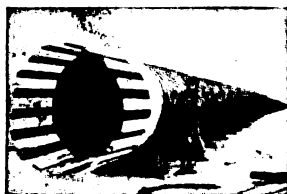


500-FT. HEAD MACHINE
BANDED WOOD PIPE

(b) collar coupling; latter is for all high pressure pipe. "American" preservative coating is applied on exterior of pipe, covering stave and wire. (For creosote treatment see below). We erect in field (see Quality and Service).

Continuous Stave Pipe

This company manufactures, and contracts to erect at site, continuous stave pipe, sizes 2 to 14 ft. diameter. Staves of highest grade, close grained yellow Douglas Fir, faces and edges finely machined to arc and radial lines, butts finely milled with saw kerf or groove, and with metal tongue or spline for perfect watertight butt joint. Staves are erected in field on movable circular forms, joints staggered with round mild steel bands, and malleable shoes, of size and spacing to requirements of pressure and pipe diameter. (For creosote treatment see below.)



60-IN. CONTINUOUS STAVE
WOOD PIPE

Continuous Stave Flume, Cedar Casing, Wood Tanks

Special literature on request covering these products.

Creosote Impregnation

When scientifically impregnated with creosote oil the life of Douglas Fir is practically imperishable under all conditions. For many conditions of service, however, the inherent qualities of Douglas Fir, its natural high durability, etc., render this treatment wholly unnecessary for pipe, flumes and tanks. (See Engineering Department Service.) It is interesting to note an official United States published statement says that the life of Douglas Fir properly creosoted is indefinite; also,

that exhaustive official tests prove that creosote has no chemical affinity for water, does not dissolve in or wash out by it, and does not taint it in any degree. Staves are not warped or impaired in strength by the process. Under the "American" process staves are thoroughly dry-kilned, placed in treating retort and boiled in creosote oil under vacuum of 26 in.; pressure is then applied and the creosote oil forced into the wood; a vacuum is then drawn to remove excess oil; minimum retention of oil in the stave is 8 lbs. per cu. ft.

Uses

American wood stave pipe is used for:

City Water Works—Because it is durable and costs less than any other pressure pipe. It has greater carrying capacity than any other pressure pipe. It delivers the water purer than any other pressure pipe.

Irrigation Systems—Because it can be constructed in any place, and of any size and length. It can be transported and built in place cheaper than any other pressure pipe. It can be transported and built in place of any size and length.

Mining and Power Plants—Because it is not corroded by sulphur or mineral waters. It does not chemically affect fluids passing through it. It has no inner exposure of metal.

Hydraulic Mining and Dredging—Because it is easily transported. It withstands erosion better than metal pipe. It is easily connected and disconnected.

Sewers—Because it is the only satisfactory high pressure sewer pipe known. It is preserved by water. It resists more chemical and mineral solutions than any other pressure pipe.

Electrical Conduits—Because it is a non-conductor of heat and cold. It is easily put in place. It resists electrolysis.

Quality and Service

"American" quality is the logical result of an efficient organization working in all departments under men trained by years of experience to produce the best.

Engineering Department Service—The AMERICAN WOOD PIPE COMPANY's engineering staff is equipped to render the highest service to clients. Pipe line engineering is today a true science, and our experience has proved that its practice is little understood outside a certain personnel who have devoted a large part of their lives to it. Vital mistakes have been made in pipe line design and in field erection, yet the final consummation of a splendid wood pipe line is simple if properly directed from the beginning. Our staff is at your service. Let us help with, and safeguard the problems.

Field Erection—Experienced superintendents are essential for erection of lines of any importance. This company is prepared to contract complete for supply and expert erection of line or will be pleased to furnish expert superintendents.

Our engineering and sales departments and our branch offices are maintained for your convenience. Write or wire nearest office.

Catalogue

Complete handbook (The Wood Pipe Engineer) supplied on request.

CONTINENTAL PIPE MANUFACTURING CO.

SUCCESSOR TO

PACIFIC COAST PIPE CO.
WASHINGTON PIPE & FOUNDRY CO.

PORTLAND WOOD PIPE CO.
NATIONAL TANK & PIPE CO. (PIPE DEPT.)

SEATTLE, WASH.

SALES OFFICES

SEATTLE, WASH., Box 1902
NEW YORK, N. Y., Woolworth Bldg.

DENVER, COLO., Mining Exchange Bldg.
PORTLAND, ORE., Lewis Building

SPOKANE, WASH., Hyde Bldg. YAKIMA, WASH., 117 A St.
BOISE, IDA., Sonna Building TACOMA, WASH., Box 1404

Products

CONTINENTAL CONTINUOUS STAVE WOOD PIPE, MACHINE BANDED WOOD PIPE, CREO-WOOD PIPE, CREO-WOOD SEMI-CIRCULAR FLUME, WOOD TANKS, STEAM PIPE CASING and CONDUIT.



TRADE-MARK

Continental Machine Banded Pipe

Made in sizes of from 2 to 32 in. inside diameter, in convenient lengths, usually from 8 to 20 ft., and for heads up to 450 ft. This pipe is banded with heavily galvanized round steel wire of high tensile strength, wound spirally around pipe under machine-developed tension to draw staves firmly together. Banding is spaced according to head under which pipe is to be used. Pipe is manufactured and shipped ready to lay, and is put together in place with couplings made in the same manner as pipe. Couplings for pipe, up



10-IN. DIAMETER CONTINENTAL PIPE WITH CREO-WOOD COLLAR

to 12 in. in diameter, are banded similarly to pipe. For larger sizes, couplings are banded with separate steel bands, the same as continuous stave wood pipe. Untreated pipe and couplings are coated on the outside with a thick asphaltum coating. All collar couplings are given our standard Creo-Wood pressure and vacuum creosoting treatment.

Continental Continuous Stave Wood Pipe

Used in diameters from 16 in. up—the largest pipe yet constructed being 168 in. (14 ft.) inside diameter. Staves are so milled that when assembled they form the size of pipe desired. In building up the pipe, staves of different lengths are laid side by side so that all joints are broken. Each stave is butted against the one immediately preceding, while saw kerfs or slots at the ends receive a thin metal tongue, thus making the construction continuous and doing away with roundabout joints of any type in the pipe. The smooth internal walls and absence of joints in continuous stave wood pipe combine to make the carrying capacity of this pipe considerably greater than that of any other type. Staves are held firmly in place by steel rods or bands,



THREE 13-FT. DIAMETER CONTINENTAL PIPE LINES

solidly cinched or tightened until every stave is firmly seated. The pressure under which pipe is to serve determines diameter and spacing of rods. This pipe is used principally for penstocks, gravity supply lines and irrigation projects.

Continental Creo-Wood Pipe

Both *machine banded* and *continuous stave*.

Made from selected lumber, treated with pure coal tar cresote oil by a special process; the wood being thoroughly preserved, the pipe will last indefinitely.

Creosoted wood pipe gives entire satisfaction laid on the ground; in loose, gravelly soil; or in clay. May be used for intermittent service or under low pressure—no damage is done when the pipe is not in use or serving under conditions of partial saturation.

These properties of creosoted wood pipe are recognized as distinct advantages in water supply and irrigation work. They are equally important when creosoted wood pipe is used for drainage or sewerage purposes. For drainage, each length of pipe is bored to permit ground water to flow readily into the pipe. For outfall sewers, creosoted wood pipe has demonstrated its special advantages.

Continental Semi-circular Creo-Wood Flume

A "Continental" product for water supply, irrigation, etc., conceived and built solely by this company. Constructed on the continuous stave pipe principle; staves and other primary parts pressure-creosoted—a sound guarantee of permanency.

Continental Steam Pipe Casing and Conduit

Steam pipe casing is extensively used throughout the United States for the insulation of steam pipes radiating from central heating stations, industrial plants and public institutions. The heat energy thus saved has been shown to repay many times the cost of the original investment. The casing is made of wood staves bound together with galvanized wire and the ends are headed to make a mortise and tenon joint. The outside is covered, like standard wood pipe, with a preservative coating and rolled in sawdust.

Continental Wood Tanks

Furnished for all purposes; standard sizes carried in stock. Tanks of special design furnished if required.

Inquiries for Pipe (Prices or Information)

Please be as explicit as possible. The following, or as much as is available, should be given:

(1) Size of pipe. (2) Hydraulic head under which it is to serve, either in feet or pounds to the square inch. (3) Length of line. (4) Rail or water destination. (5) Purpose for which pipe is to be used. (6) Whether gravity or pumping system. (7) Total maximum discharge.

Estimates—Continuous stave lines—profile should be furnished as size and spacing of bands are governed by the head and vary for changes of head.

Co-operation—An engineering staff is maintained for the convenience of customers.

ESTABLISHED 1869

THE MICHIGAN PIPE CO.

BAY CITY, MICH.

REPRESENTATIVES

MONTREAL, QUE., 204 St. James Street
 NEW YORK, N. Y., 17 East 32nd Street
 OKLAHOMA CITY, OKLA., 330 1/2 West 10th Street

PHILADELPHIA, PA., 318 Widener Building
 BOSTON, MASS., 93 Broad Street
 CHATTANOOGA, TENN., James Building

CHICAGO, ILL., Leiter Building, 15 East Van Buren Street
 CLEVELAND, OHIO, 919 Ulmer Building

Products

"MICHIGAN" COMBINATION STEEL and WOOD WATER, GAS and ACID PIPE.

Also manufacturers of "Michigan" Tin Lined Wood Casings for insulating underground steam and hot water pipes.

"Michigan" Combination Steel and Wood Water Pipe

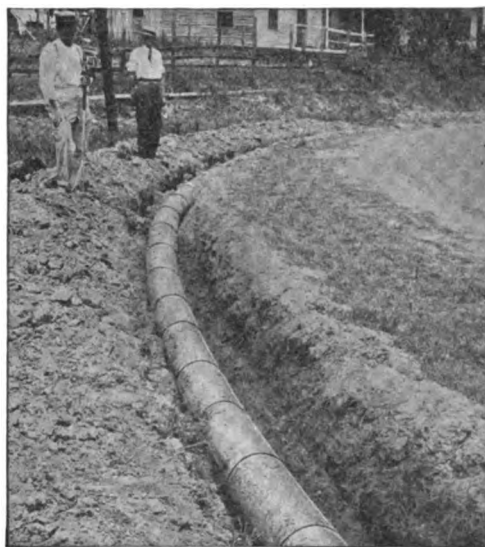
Scope of Use—Recommended for use in conveying liquids of all kinds in all climates, as follows:

- (1) Municipal water supply and distribution systems.
- (2) Mines and railroads.
- (3) Flumes and irrigation systems.
- (4) Gravity and pressure feed water lines for mills and factories.
- (5) Hydro-electric plants.
- (6) Liquors in tanneries.
- (7) Hot slops from distilleries.
- (8) Acids and gases in chemical plants.
- (9) Pulp in paper mills.
- (10) Mineral waters for bottling purposes.
- (11) Heavy fluids containing grit.
- (12) Ventilating lines and stacks for gas and acid fumes.
- (13) Water and culm in mines.
- (14) Acidulous and sulphurous water.

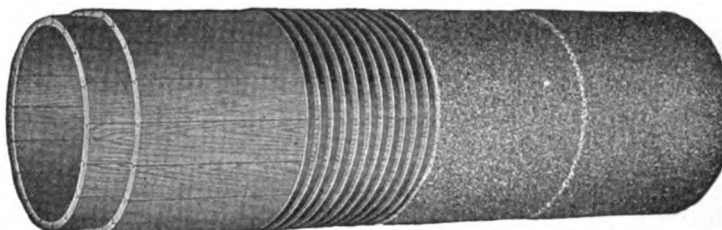
Description—Made of thoroughly seasoned Canadian white pine, Douglas fir or "Michigan Tamarack" staves, machined on the sides forming double tongue and groove for interlocking. Constructed in

sections up to 12 ft. long, spirally banded under heavy tension with steel banding; each section with a mortise on one end and a tension on the other. Outside surface covered with thick double coating of special durable waterproof asphaltum and rolled in fine sawdust while hot.

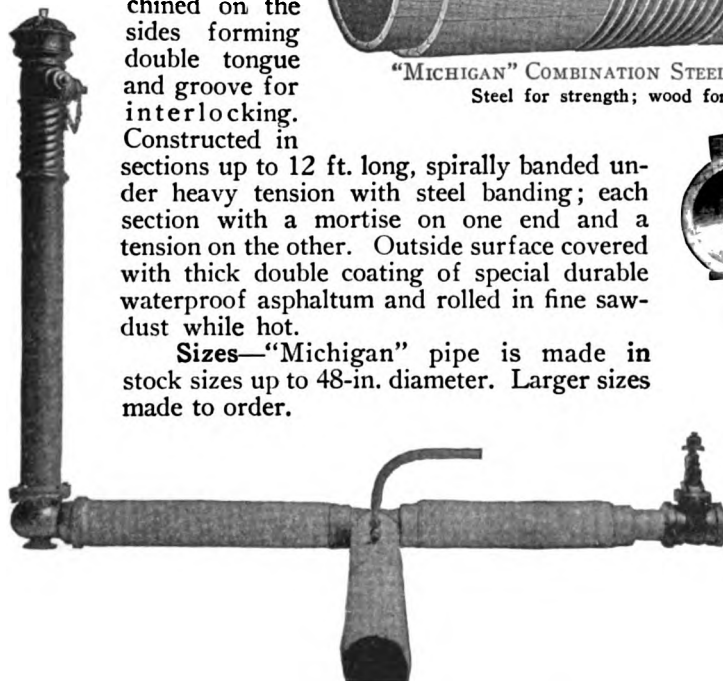
Sizes—"Michigan" pipe is made in stock sizes up to 48-in. diameter. Larger sizes made to order.



AN INSTALLATION OF "MICHIGAN" SPECIAL CURVED WOOD PIPE



"MICHIGAN" COMBINATION STEEL AND WOOD WATER PIPE
 Steel for strength; wood for durability



CAST IRON FITTINGS, HYDRANT AND VALVE CONNECTED TO "MICHIGAN" PIPE

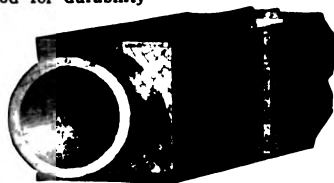
Fittings—Special cast iron fittings furnished in any description, carefully machined to accommodate "Michigan" pipe. For acid and chemical work, special wood fittings of any description as shown.

Reasons for Using "Michigan" Pipe—

- (1) Durability of wood.
- (2) Sanitation.
- (3) 20% more capacity than metal pipe.
- (4) Simplicity in handling.
- (5) Light weight.
- (6) Speed in laying.
- (7) Protection against freezing.
- (8) Not affected by electrolysis.
- (9) Rigid inspection at factory.
- (10) Efficient construction.
- (11) Great strength.
- (12) Asphaltum protection.
- (13) Can not burst.
- (14) Can be laid in wet trench.
- (15) Short curves without specials.
- (16) Low installation and maintenance.
- (17) 44 years of continued service.
- (18) Easy service connections.
- (19) Requires no skilled labor.
- (20) Responsibility of company.

Data Required When Making Inquiries—Give in detail specifications of work, such as whether the line is direct pumping or gravity flow, size of pipe, pressure to be maintained and for what purpose to be used.

Shipment—Immediate shipment can be made from stock.



SPECIAL SQUARE LIQUOR LOG FOR ACID OR CHEMICAL USE

"Michigan" Service

This company has a field service department of six professional men. The Engineering Department offers free consulting service in connection with construction of either direct pumping or gravity water works systems, and in solving problems of handling liquids in any form. When laying large lines of pipe, or small lines under difficult conditions, a field superintendent able to entirely supervise the installation will be furnished at a nominal charge. For construction of large lines of "Michigan" pipe, the company furnishes free of charge field superintendent to instruct the acting superintendent in charge regarding the laying and handling of "Michigan" pipe.

PACIFIC TANK & PIPE CO.

318 Market Street
SAN FRANCISCO, CAL.

BRANCHES

NEW YORK, N. Y., 2 Rector Street
SALT LAKE CITY, UTAH, 403 Kearns Building

LOS ANGELES, CAL., 4820 Santa Fe Avenue
CHICAGO, ILL.

AGENTS

SANTIAGO, CHILE, BUCHANAN JONES & Co.

Products

PACIFIC WOOD STAVE PIPE, made of Redwood, creosoted or plain Douglas Fir lumber.

PACIFIC WOOD TANKS, made of Redwood, Douglas Fir, and other special woods that may be desired, for all purposes.

Also manufacturers of Wood and Iron Towers for elevated tanks, and Pacific Silos.

Pacific Wood Stave Pipe

Offers a reliable medium for carrying water at a minimum cost, with an assured long life and lowest possible friction loss.

Pacific Machine Banded Pipe

Manufactured in sizes from 2 to 32 in. inside diameter. This type is shipped "set up" from factory in random lengths up to 24 ft., averaging approximately 13 ft.

The pipe is built of clear, well seasoned staves, milled from lumber that is carefully graded and thoroughly inspected for this purpose. Staves are held in place by heavily galvanized copper bearing steel wire wound around the pipe by specially constructed winding machines.



TYPICAL INSTALLATION OF PACIFIC MACHINE BANDED PIPE

Accurate, carefully turned tenons are milled on each end of pipe to fit couplings. Couplings of various kinds (inserted joint, wood couplings, cast iron couplings) so designed and constructed to withstand a greater pressure than the pipe is banded for, are placed on the ends of the pipe. These couplings are carefully manufactured so as to make a true and accurate fit with the tenons.

Coating—After manufacture the exterior of Pacific machine banded pipe is dipped in a preservative asphalt bath, increasing the life of the banding against destruction by the elements and foreign matter in the soil.

Pressure—Pacific machine banded pipe is banded to withstand various pressures up to 400-ft. head, in multiples of 50 ft.

Pacific Continuous Stave Pipe

This pipe is made in sizes from 12 in. to 16 ft., the materials being shipped, knocked down, from point of manufacture to the nearest railroad or steamship point to the installation, transported along the side of the work, and then materials are constructed into pipe under supervision of skilled, trained foremen.

The pipe is built of clear, well seasoned staves, milled from lumber that is carefully graded and thoroughly inspected for this purpose. The staves are held together by round steel bands varying in size from $\frac{3}{8}$ to 1 in., depending on the diameter of the pipe.



PACIFIC CONTINUOUS STAVE PIPE

The bands are connected by malleable iron shoes. The ends of the staves are connected by steel or patented quarter sawed oak tongues of such size as to seat into adjoining staves in all directions.

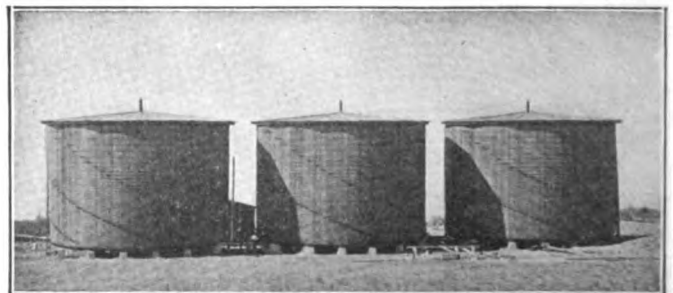
Construction—It is customary for us to quote prices on continuous stave pipe installed in place. All materials to be delivered to nearest railroad point of manufacture in knocked down form, and we to furnish all necessary labor to construct the materials into pipe, the purchaser to haul materials, provide trench or bench and to perform all other work.

Pacific Tanks

We are in position to supply Pacific tanks made of either California Redwood or Douglas Fir in various styles, either rectangular or round. We supply tanks for mining purposes and for holding oil. These tanks are made in various sizes from 500 to 500,000 gals. capacity, fitted with round hoops and malleable iron straight pull lugs.

We have supplied some of the largest mining, industrial, and chemical plants with our equipment, and have a long list of references.

Send for our 130-page descriptive catalogue on "Mining Tanks and Equipment."



INSTALLATION OF PACIFIC TANKS FOR WATER SUPPLY

STANDARD WOOD PIPE COMPANY

Manufacturers of Wood Water Pipe and Steam Pipe Covering
WILLIAMSPORT, PA.

Products and Services

MACHINE BANDED WOOD STAVE PIPE.

SOLID BORED WOOD PIPE.

STEAM PIPE COVERING for underground exposed steam and hot water pipe.

Also manufacturers of Continuous Wood Stave Pipe.

We build Pipe for water works systems, power plants, municipalities, mill and manufacturing plants, mining and railroad water supplies, irrigation systems, mine culm, salt water mains, heavy fluids, acids, pulp, brine and sewage disposal, also steam pipe covering.

General

We are endeavoring to describe our product briefly on this page, as much as space will permit. The plates in this issue give descriptions of the various kinds of pipe we make. For full details write for our general catalogue, which gives valuable information concerning wood pipe and steam pipe covering.

Machine Banded Wood Stave Pipe

Staves are made from white pine lumber, Douglas fir, redwood or cypress. They are dressed and finished to a circumference corresponding to the radius at both inner and outer faces.

Staves are double tongued and grooved. Each section of pipe is provided with a tenon and chamber 3 to 4 in. deep, depending on the size. Pipe is spirally wound with steel bands or galvanized wire.

Gauge and spacing of bands are determined by pressure and size required. Pipe is rolled in a bath of hot asphaltum pitch and then rolled in sawdust.

Made in diameters from 2 to 48 in. inclusive. Thickness of wall is 1½ to 3 in., or heavier if desired, depending on size of pipe.

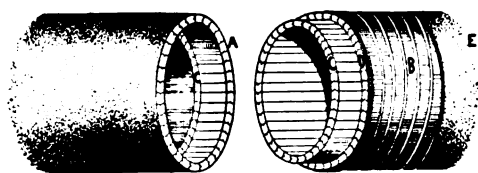


PLATE No. 16. MACHINE BANDED WOOD STAVE PIPE

A—Thickness of chamber and tenon C and D—Thickness of shoulder.
B—Wire banding Also shows tongues and grooves
E—Protective coating

Solid Bored Wood Pipe

Made from solid log up to 8 ft. in length and bored 1½ to 8 in. inclusive. Outside turned off to a perfect diameter, reinforced with banding and coated on the outside in the same manner as the stave pipe shown on plate No. 16.



PLATE No. 70. SOLID BORED WOOD PIPE

A—Banded pipe before it is coated. B—Pipe completed with coating applied

Square Wood Pipe

Especially built for tanneries and chemical plants. Made in lengths up to 8 ft. and bored 1½ to 8 in. inclusive.

Provided with tenon and socket joints, having a steel banding driven around the chamber end to protect the wood from splitting.



PLATE No. 32. SQUARE WOOD PIPE

Steam and Hot Water Pipe Casing

Single Layer—Made of selected white pine staves 2, 3 and 4 in. thick as shown on plate No. 44. Each stave has a double tongue and groove on the same order as our machine banded wood stave pipe, and joined together. Wound with heavy galvanized wire and then coated with asphaltum pitch on the outside and rolled in sawdust.

Furnished unlined or tin lined.



PLATE No. 44. SINGLE LAYER CASING

A—Thickness of wall. B—Galvanized wire. C—Protective coating

Double Layer—Consists of two thicknesses of lumber as shown on plate No. 99.

Furnished unlined or tin lined.

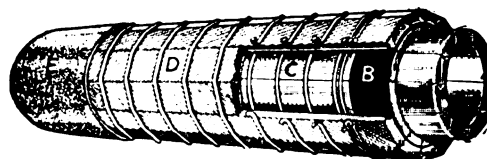


PLATE No. 99. DOUBLE LAYER CASING

A—Inner shell, 2 in. thick C—Dead air space
B—Asphaltum packing D—Outer shell, 1 in. thick
E—Protective coating

Wood Pipe Fittings

In connection with our cast iron specials we make wood connections of any angle for various pressures. They are used in coal mines and chemical plants where iron fittings can not be used.

Boxes for steam pipe casing of any degree are made on the same order with the exception that they are split in two sections and reinforced with iron bolts, forming an adjustable connection made to correspond to the size of the pipe, so it may be put in its place after the casing and the iron pipe are installed.

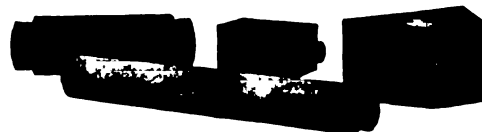


PLATE No. 21. WOOD PIPE FITTINGS

A—Complete section of wood pipe C—Wood tee
B—Section of wood pipe with tenons on each end, used in some instances to connect fittings D—45° wood ell

A. WYCKOFF & SON COMPANY

Manufacturers of Acidproof Wood Water Pipe

MAIN OFFICE AND FACTORY
ELMIRA, N. Y.

BRANCH OFFICES

PITTSBURGH, PA., JOHNSON-PETER Co., Pittsburgh Terminal Warehouse
ATLANTA, GA., H. H. WHITE, Fourth National Bank Building

SCRANTON, PA., VALLEY SUPPLY Co., Coal Exchange Building

Products

MACHINEMADE WOOD STAVE PIPE for water works systems, power plants, paper mills, manufacturing plants, mines, railroad water supplies and chemical plants.

UNDERGROUND WOODEN STEAM PIPE CASING.

Wyckoff Wood Stave Pipe

Uses—Wyckoff wood stave pipe is adapted for use as follows: (1) When normal or constant pressure does not exceed 160 lbs. (2) For a supply main, from source of supply. (3) For penstocks. (4) For carrying water highly charged with acids—mine water (hot and cold), mine culm, tan liquors, mineral spring waters; heavy fluids, pulps, brine, and gases in fertilizer works, paper mills or provision factories; also, diluted sulphuric, nitric, muriatic, acetic and tartaric acids.

It is made from selected Canadian pine. All staves are double tongued and grooved, with faces planed, under close inspection. Winding machine so arranged that staves are banded together or wound with a steel band, at desired uniform tension. Pipe is rendered watertight by tightly squeezing tongues into grooves. Maximum pipe lengths, 12 ft.; shorter sections permit pipes to be laid on curves, without iron fittings.



WOOD STAVE PIPE

Protective coating omitted from pipe to show steel bands. Note double winding at end

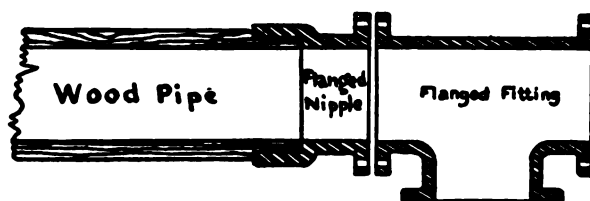
Special Advantages—(1) Wyckoff machinemade wood pipe is as durable as cast iron, and more durable than steel; is laid more cheaply than either and is as cheaply maintained; and will carry much more water, with equal diameter. (2) No skilled labor required to lay. (3) Narrow trench. (4) No electrolysis. (5) No corrosion by fumes and acids. (6) No destruction of pipe by sulphur or other impurities in minerals. (7) Fluids are not contaminated. (8) Elasticity of wood

retards bursting. (9) Can be laid in wettest kind of trench. (10) Pipe unaffected by salt water. (11) Montezuma asphalt coating, the best known protection to steel bands, is used exclusively.

Sizes—All sizes from 1 to 48 in. in diameter promptly supplied.

Durability of Wood Pipe—Wooden mains did efficient service in London, England, for over 63 years; in Philadelphia, Pa., and Burlington, N. J., for over 49 years; and in eastern cities of United States, for long periods of time.

Joint Fittings—For general purposes, special cast iron fittings are furnished, also to connect the wood pipe to cast iron pipe. Wooden crosses, tees and ells are made up to 10 in. in diameter, by properly boring heavy blocks cut from square timbers.



METHOD OF ATTACHING FLANGE FITTING

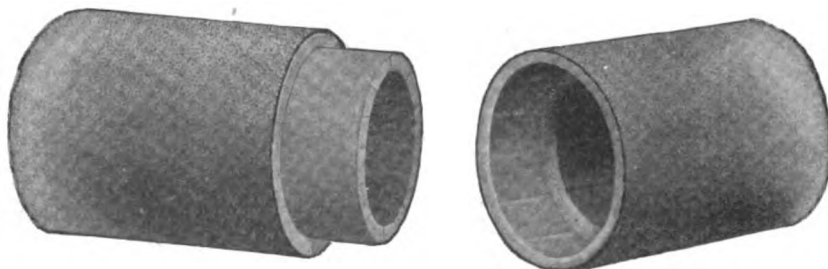
Cost of Laying Wyckoff Pipe—Cost of furnishing and laying is about one-third the outlay for cast iron pipe. No special labor or materials needed in making joints. Its lightness permits laying the largest sizes without use of block and fall.

Wyckoff Improved Steam Pipe Covering

This covering is built of Cypress, "the wood eternal." The inner shell of 2 in. and outer shell of 1 in. with $\frac{1}{4}$ in. dead air space between has proved to be the best known protection for underground steam and hot water pipes. The asphaltum packing placed between the shells on the ends of each length and the driven joint make it watertight. The cut shows the covering before being coated with Montezuma asphalt.

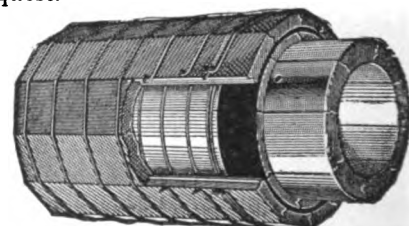
Catalogue

Catalogue and prices furnished on request.



TWO ENDS OF WOOD PIPE

Tenon and socket joints of wood pipe that will stand a pressure of 160 lbs. per sq. in. by simply driving them together



IMPROVED STEAM PIPE CASING BEFORE COATING

L. S. GELSER & SON, INC.

Manufacturers of Reinforced Concrete Pipe

FILLMORE, N. Y.

Product

"GELSER" REINFORCED CONCRETE SLUICE and BELL END PIPE, for use in sewers, sluices, culverts, etc.

Advantages

Cost is but one-half that of best cast iron and two-thirds that of best corrugated pipe, while they will withstand all road traffic equally well.

They will not rust like iron pipe or rot like terra cotta, neither will sulphur water, the great enemy of cast iron, have any deleterious effects on them—in fact, they grow stronger with age and are absolutely permanent.

Construction

Pipe are manufactured by expert concrete workmen, mixing being done thoroughly by machine, the aggregates consisting of the best portland cement procurable, the highest grade of washed sand and gravel, and pure spring water, which, altogether, insure a perfect product when properly cured.

Curing is accomplished by keeping pipe under cover protected from all air currents for a period of ten days after moulding, and thoroughly sprinkling three times each day.

Reinforcement

Sluice Pipe—Tongue and groove, 2-ft. lengths. Mixture, $2\frac{1}{2}$ parts sand and gravel, 1 part cement. Reinforced with 6 to 9 twisted splice wire hoops to 2-ft. length; gauge, No. 6 to No. 10, according to size.

Bell End Pipe—Mixture, 1 cement, 2 sand, 4 crushed stone, mixed to quaking consistency and thoroughly spaded while being poured into

forms. Made in 4-ft. and 6-ft. lengths. Reinforced with American Steel & Wire Co. Electric Welded Mesh.

Guarantee

This company agrees to furnish pipe, free of charge, in place of any which break during transportation, or for a period of 5 years after being installed.

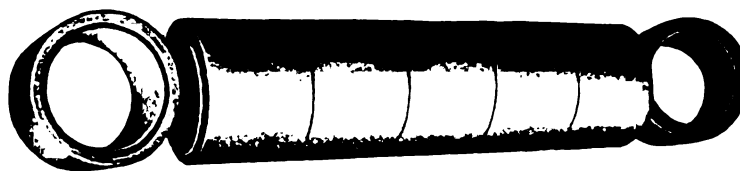
From the nature of concrete, it is safe to assume that if these pipe will stand for 5 years, they will stand for all time.

State Road Work

This company specializes in pipe for this class of work and guarantees same to meet specifications of state highway departments.

Shipment

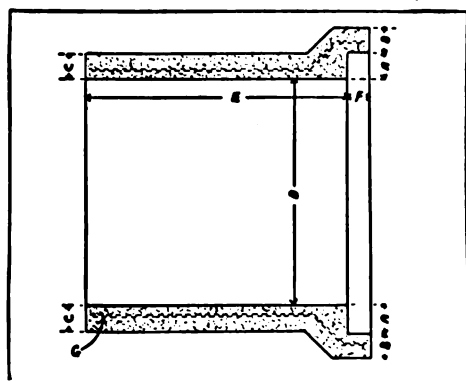
Sufficient stock of well seasoned pipe is carried at all times to fill orders promptly.



REINFORCED CONCRETE SLUICE PIPE
STANDARD SPECIFICATIONS

Size, in.	Weight, per ft., lbs.	Thickness, in.	Length, ft.
8	45	1½	2
10	58	2	2
12	92	2½	2
15	109	2½	2
18	157	2½	2
24	245	3½	2
30	369	3½	2
36	480	4½	2

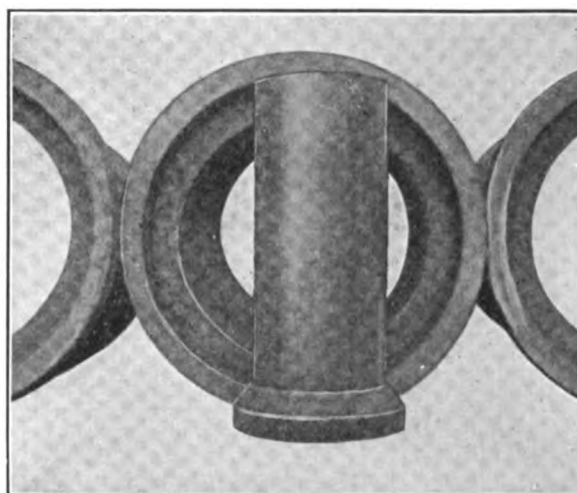
Price on application.



DIMENSION DIAGRAM REINFORCED CONCRETE BELL END PIPE
STANDARD SPECIFICATIONS

Dimensions						Weight per lin. ft., lbs.	Reinforcement G—A. S. & W. Electric Welded
D in.	A in.	B in.	C in.	E ft.	F in.		
12	2½	2	2	4 and 6	2½	95	1 layer size .070
15	2½	2½	2½		2½	115	1 " " .094
18	3	2½	2½		2½	165	1 " " .123
24	3½	3	3		3½	255	1 " " .180
30	4	3½	3½		3½	380	2 " " .162
36	4½	4	4		3½	500	2 " " .187
42	5	4½	4½		4½	850	2 " " .221
48	5½	5	5		5½	1000	2 " " .258
54	6½	5½	5½		5½	1200	2 " " .295
60	6½	6	6		6	1500	2 " " .330

Price on application.



REINFORCED CONCRETE BELL END PIPE

Some Users

Pennsylvania State Highway Department, Harrisburg, Pa.
Tuxedo Park Association, Tuxedo, N. Y.
Harrison County, Clarksburg, W. Va.
Marion County, Fairmont, W. Va.
Edward T. Beck, Warren, Pa.
F. C. Elliott, Trustee, Athens, Ohio
Rose Township, Jefferson Co., Pa.
Armstrong Township, Indiana Co., Pa.

LOCK JOINT PIPE CO.

TELEPHONE
ORANGE 4771, 4772, 3963

MAIN OFFICE AND WORKS
AMPERE, N. J.

NEW YORK OFFICE
165 BROADWAY

Product

"LOCK-JOINT" CONTINUOUS REINFORCED CONCRETE PIPE, for Sewers, Water Lines, Intake and Discharge Pipes, etc.

The "Lock-Joint" System for Sewers

This system provides a continuous reinforced concrete pipe, laid in sections, in which joints between sections are so made as to insure freedom from leakage or obstacles to flow.

The standard design has a circular section cast with a bell and a spigot end, the bell being flush with the outside circumference of pipe.

Sizes range from 24 to 108 in. in diameter in 4-ft. lengths, and longer lengths when necessary. This company has a large stock of moulds and a force of ex-

pert superintendents, and is in a position to furnish pipe anywhere.

Advantages—Pipes are made above ground, in a vertical position, resulting in maximum density of the concrete. Entire exterior and interior surface can be inspected. Joints are on the interior of the pipe and also can be easily inspected. The "lock-joint" gives the same strength in the joint as in the body of the pipe—therefore no weak spots. Minimum of trench necessary to be open. Lay the pipe as fast as bottom is reached, then immediately backfill, as soon as pipe is laid.

Immediate Shipments—12-in. to 48-in. bell end state highway culvert pipe.

24-in. to 48-in. standard sewer pipe.

Subaqueous Pipe

For powerhouses, water works, sewage plants, etc., made in approximately 20-ft. lengths, with cast iron flanges mounted into each end. Lengths are lowered into place and flanges are bolted together by divers.

Special designs for special cases.

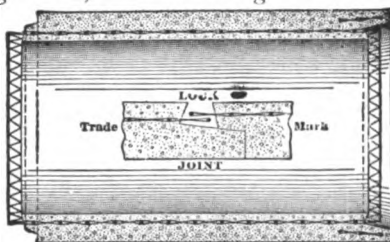
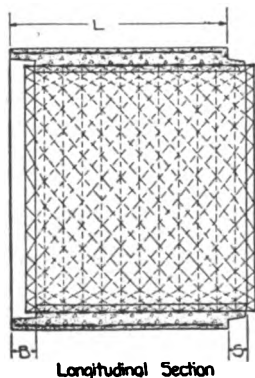
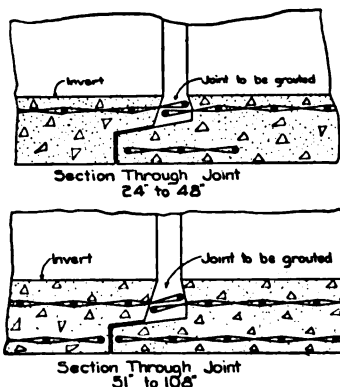


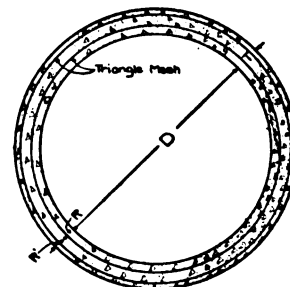
DIAGRAM OF SECTION OF PIPE AND
"LOCK-JOINT"



Longitudinal Section



Section Through Joint
31' to 108"



Cross Section

DIMENSION DIAGRAMS STANDARD SEWER PIPE

Dimensions							Reinforcement layers	A. S. & W. Triangle Mesh Style No.	Dimensions							Reinforcement layers	A. S. & W. Triangle Mesh Style No.
D in.	T in.	L ft.	B in.	S in.	R in.	R' in.			D in.	T in.	L ft.	B in.	S in.	R in.	R' in.		
24	3	4	3	1 1/2	1		1	28	57	5 1/2	4	5 1/2	3 1/2	1 3/4	1	2	34
27	3 1/2	4	3	1 1/2	1		1	28	60	6	4	5 1/2	3 1/2	2	1	2	34
30	3 1/2	4	3	1 1/2	1		1	27	63	6	4	5 1/2	3 1/2	2	1	2	34
33	4	4	4	2 3/8	1 3/4		1	35	66	6 1/2	4	5 1/2	3 1/2	2	1	2	34
36	4	4	4	2 3/8	1 3/4		1	34	72	7	4	5 1/2	3 1/2	2	1	2	23
39	4	4	4	2 3/8	1 3/4		1	34	78	8	4	5 1/2	3 1/2	2	1	2	33
42	4 1/2	4	4	5 1/2	3 1/2		1	34	84	8	4	5 1/2	3 1/2	2	1	2	33
45	4 1/2	4	4	5 1/2	3 1/2		1	34	90	8	4	5 1/2	3 1/2	2	1	2	31
48	5	4	4	5 1/2	3 1/2		1	23	96	8 1/2	4	5 1/2	3 1/2	2	1	2	39
51	5	4	4	5 1/2	3 1/2	1	2	26	108	9	4	5 1/2	3 1/2	2	1	2	38
54	5 1/2	4	4	5 1/2	3 1/2	1	2	26									



54-INCH AND 66-INCH PIPE MANUFACTURED FOR INTERCEPTING SEWER, ALBANY, N. Y.

Pressure Pipe

This company manufactures and installs reinforced concrete pipe in sizes 15 to 108 in. in diameter for water supply or any purpose where pipes are subject to hydraulic head up to 150 ft.

These pipes are manufactured of a richer mix of concrete. Great care is taken in the mixing of the same.

Individual pipe sections are generally made in lengths of 12 ft.; shorter lengths are made for the very large sizes.

The smaller sizes are made with lead and iron expansion joints. The larger sizes are generally made with lead and steel expansion joints. These joints are made to take care of the expansion and contraction in the pipe line due to temperature changes and settlement.

Advantages—Reinforced concrete pipes manufactured under methods used by this company are smooth and joints offer no hindrance to flow of water.

There are no offsets or projections to encourage growth in the pipes, with the result that the carrying capacity of these pipes is as great as, if not greater than, any other type of pipe.

From actual test, "n" in Kutter's formula has been found to be less than .011. In addition to this, well

made reinforced concrete is known to be an extremely permanent material.

Estimates, etc.

Plans, specifications and estimates will be furnished to those desiring same, on receipt of information giving heads to be carried, sizes and quantities of pipe, location of work, and, if possible, prices of sand, stone and cement, delivered along the line, as the pipes are manufactured on the job.



42-INCH WATER LINE, SEATTLE, WASH.

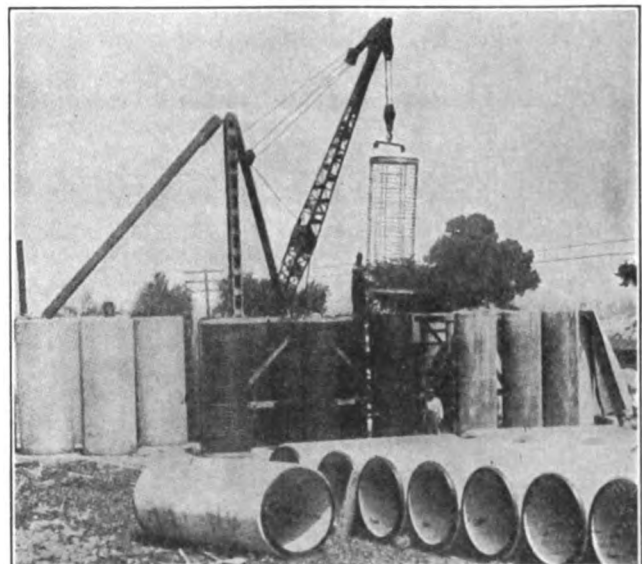


VIEWS OF 42-INCH "LOCK-JOINT" PIPE FOR SOOKE LAKE WATER SUPPLY, VICTORIA, B. C.

Length of line, 27 1/2 miles; longest tangent on line, 600 ft.
53% of line laid on curves

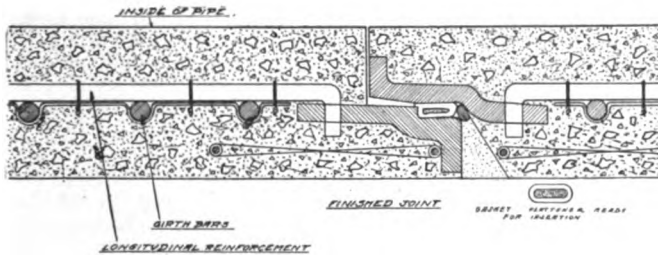
Cost

Inasmuch as the pipes are, in almost all cases, manufactured on the ground, local price of materials, such as sand, stone, and cement and steel, naturally influences the cost. However, reinforced concrete pipe is, in almost all cases, considerably less expensive than metal pipe.

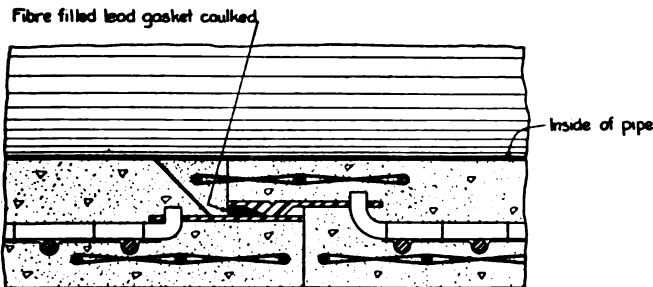


YARD AT KANSAS CITY, MO.

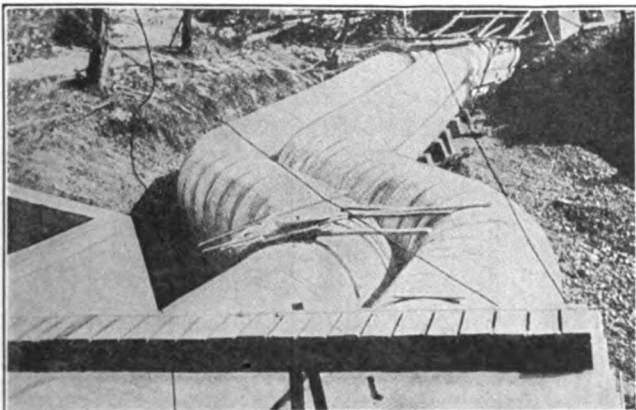
Showing manufacture of 48-in. copper expansion joint pipe



LEAD AND IRON EXPANSION JOINT



LEAD AND STEEL EXPANSION JOINT



TWIN LINE PENSTOCK, 72-IN. PIPE, POMPTON LAKES, N. J.

UNITED STATES CAST IRON PIPE AND FOUNDRY CO.

GENERAL OFFICES
BURLINGTON, N. J.

SALES OFFICES

PHILADELPHIA, PA., Morris Building
NEW YORK, N. Y., 71 Broadway
PITTSBURGH, PA., Henry W. Oliver Building
CHICAGO, ILL., Peoples Gas Building
CLEVELAND, OHIO, 1150 East 22nd Street
DALLAS, TEX., Scollard Building

BIRMINGHAM, ALA., American Trust Building
ST. LOUIS, MO., Security Building
SAN FRANCISCO, CAL., Monadnock Building
MINNEAPOLIS, MINN., Plymouth Building
BUFFALO, N. Y., 957 East Ferry Street
CINCINNATI, OHIO, Dixie Terminal Building

Products

CAST IRON BELL and SPIGOT PIPE for Water and Gas Mains and Services; FLANGED PIPE for Steam or Chemicals; FITTINGS; BAROMETRIC COUNTER CURRENT CONDENSERS.

Also manufacturers of Flexible Joint Pipe for submerged lines; High Pressure Lug Pipe and Fittings for fire protection lines; Plain End and Threaded Cast Iron Pipe; Keystone Columns, Caps and Bases; Foundry Products including Tanks, Sluice Gates, Screw Piles, Coal Chutes and Bunkers; Chemical Apparatus, such as Acid Eggs, Evaporators, Autoclaves, Retorts, etc.; Large Castings for all purposes made to purchasers' designs; Gas Producers.

Cast Iron Water Pipe

Cast iron pipe has been used for the carrying of water for generations and is today considered the standard pipe for water. Cast iron water lines laid in 1664 are still in service. A cast iron line laid in this country in 1817 was disconnected after 98 years and then only because the demand for water exceeded its capacity.

Specifications for Cast Iron Water Pipe

Following is an extract from the specifications of the American Water Works Association, adopted as our manufacturing standard for water pipe. Write for copy of complete specifications.

We are equipped to make standard pipe in all regular sizes from 2 to 84 in.

Description of Pipe—Section 1—The pipe shall be made with hub and spigot joints and shall accurately conform to the dimensions given in Tables Nos. 1 and 2. They shall be straight and shall be true circles in section, with their inner and outer surfaces concentric, and shall be of the specified dimensions in outside diameter. They shall be at least 12 ft. in length, exclusive of socket.

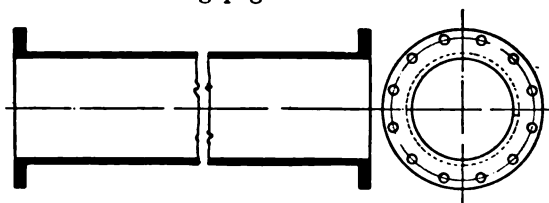
For pipe 4 to 12 in. inclusive, one class of special castings shall be furnished, made from Class D pattern. Those having spigot ends shall have outside diameters of spigot ends midway

between the two standards of outside diameter as shown by Table No. 1, and shall be tapered back for a distance of 6 in. For pipe from 14 to 24 in. inclusive, two classes of special castings shall be furnished: Class B special castings with Classes A and B pipe, and Class D special castings with Classes C and D pipe. For pipe 30 to 60 in. inclusive, four classes of special castings shall be furnished, one for each class of pipe.

Allowable Percentage of Variation in Weight—Section 7—No pipe shall be accepted the weight of which shall be less than standard weight by more than 5% for pipe 16 in. or less in diameter, and 4% for pipe more than 16 in. in diameter, and no excess above standard weight of more than the given percentage for the several sizes shall be paid for. Total weight to be paid for shall not exceed for each size and class of pipe received the sum of the standard weights of the same number of pieces of the given size and class by more than 2%. No special casting shall be accepted the weight of which shall be less than the standard weight by more than 10% for pipe 12 in. or less in diameter, and 8% for larger sizes, except that curves, Y-pieces and breeches pipe may be 12% below standard weight, and no excess above standard weight of more than above percentages for the several sizes will be paid for. These variations apply only to castings made from standard patterns.

Flanged Pipe

In recent years, the tightness and strength of the flanged joint have become of value for many special purposes. Flanged pipe is very generally used in power stations and similar buildings, where pipe lines are well supported. The dimensions of flanges, drilling, etc., adopted as standard for all flanged pipe except that for gas, are those recently adopted by the Committee of Manufacturers and the American Society of Mechanical Engineers, and known as the "American 1914 Standard." See table on following page.



STANDARD FLANGED PIPE FOR WATER

TABLE NO. 2. STANDARD THICKNESS AND WEIGHTS OF BELL AND SPIGOT CAST IRON WATER PIPE

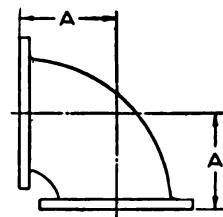
Nominal inside diameter in.	CLASS A 100-ft. head 43 lbs. pressure			CLASS B 200-ft. head 86 lbs. pressure			CLASS C 300-ft. head 130 lbs. pressure			CLASS D 400-ft. head 173 lbs. pressure			Nominal inside diameter in.
	Thick- ness, in.	Weight, lbs. per		Thick- ness, in.	Weight, lbs. per		Thick- ness, in.	Weight, lbs. per		Thick- ness, in.	Weight, lbs. per		
		ft.	length		ft.	length		ft.	length		ft.	length	
4	.42	20.0	240	.45	21.7	260	.48	23.3	280	.52	25.0	300	4
6	.44	30.8	370	.48	33.3	400	.51	35.8	430	.55	38.3	460	6
8	.46	42.9	515	.51	47.5	570	.56	52.1	625	.60	55.8	670	8
10	.50	57.1	685	.57	63.8	765	.62	70.8	850	.68	76.7	920	10
12	.54	72.5	870	.62	82.1	985	.68	91.7	1100	.75	100.0	1200	12
14	.57	89.6	1075	.66	102.5	1230	.74	116.7	1400	.82	129.2	1550	14
16	.60	108.3	1300	.70	125.0	1500	.80	143.8	1725	.89	158.3	1900	16
18	.64	129.2	1550	.75	150.0	1800	.87	175.0	2100	.96	191.7	2300	18
20	.67	150.0	1800	.80	175.0	2100	.92	208.3	2500	1.03	229.2	2750	20
24	.76	204.2	2450	.89	233.3	2800	1.04	279.2	3350	1.16	306.7	3680	24
30	.88	291.7	3500	1.03	333.3	4000	1.20	400.0	4800	1.37	450.0	5400	30
36	.99	391.7	4700	1.15	454.2	5450	1.36	545.8	6550	1.58	625.0	7500	36
42	1.10	512.5	6150	1.28	591.7	7100	1.54	716.7	8600	1.78	825.0	9900	42
48	1.26	666.7	8000	1.42	750.0	9000	1.71	908.3	10900	1.96	1050.0	12600	48
54	1.35	800.0	9600	1.55	933.3	11200	1.90	1141.7	13700	2.23	1341.7	16100	54
60	1.39	916.7	11000	1.67	1104.2	13250	2.00	1341.7	16100	2.38	1583.3	19000	60
72	1.62	1281.9	15380	1.95	1547.3	18570	2.39	1904.3	22850	.....	.....	.....	72
84	1.72	1635.8	19630	2.22	2104.1	25250	.....	.....	.....	.....	.....	.....	84

The above weights are per length to lay 12 ft., including standard sockets; proportionate allowance to be made for any variation.
Note: Table numbers throughout this presentation of pipe and fittings conform to those of general U. S. Catalogue.

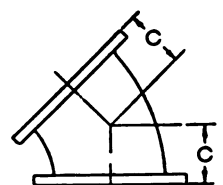
TABLE NO. 33. STANDARD FLANGED WATER PIPE

Nominal diameter, in.	Diameter flange, in.	Diameter bolt circle, in.	Number of bolts	Diameter bolts, in.	Thickness of flange, in.	CLASS A 100-ft. head 43 lbs. pressure				CLASS B 200-ft. head 86 lbs. pressure				CLASS C 300-ft. head 130 lbs. pressure				CLASS D 400-ft. head 173 lbs. pressure			
						Thickness, in.	Weight, lbs. per			Thickness, in.	Weight, lbs. per			Thickness, in.	Weight, lbs. per			Thickness, in.	Weight, lbs. per		
							ft.	length	single flange		ft.	length	single flange		ft.	length	single flange		ft.	length	single flange
3	7.50	6.00	4	$\frac{3}{8}$	.75	.39	13.0	169	6.4	.42	14.6	188	6.2	.45	15.5	198	6.2	.48	16.4	209	6.2
4	9.00	7.50	8	$\frac{3}{8}$	.94	.42	18.0	238	11.1	.45	20.1	263	10.7	.48	21.3	277	10.7	.52	22.8	295	10.7
6	11.00	9.50	8	$\frac{3}{8}$	1	.44	27.9	365	15.0	.48	31.1	402	14.4	.51	32.9	424	14.4	.55	35.3	452	14.4
8	13.50	11.75	8	$\frac{3}{8}$	1.13	.46	38.7	511	23.1	.51	42.7	559	23.1	.56	48.0	620	22.0	.60	51.2	658	22.0
10	16.00	14.25	12	$\frac{3}{8}$	1.19	.50	51.9	687	32.2	.57	58.8	770	32.2	.62	65.5	847	30.6	.68	71.4	918	30.6
12	19.00	17.00	12	$\frac{3}{8}$	1.25	.54	67.0	899	47.7	.62	76.4	1012	47.7	.68	85.4	1116	45.6	.75	93.7	1216	45.6
14	21.00	18.75	12	$\frac{3}{8}$	1.38	.57	82.3	1104	58.1	.66	94.7	1253	58.1	.74	108.1	1407	55.1	.82	119.2	1541	55.1
16	23.50	21.25	16	$\frac{3}{8}$	1.44	.60	98.8	1332	73.2	.70	114.6	1522	73.2	.80	133.3	1738	69.1	.89	147.5	1908	69.1
18	25.00	22.75	16	$\frac{3}{8}$	1.56	.64	118.3	1576	78.1	.75	137.8	1810	78.1	.87	162.4	2094	72.8	.96	178.4	2286	72.8
20	27.50	25.00	20	$\frac{3}{8}$	1.69	.67	137.4	1848	99.8	.80	163.1	2157	99.8	.92	190.6	2473	92.9	1.03	212.3	2733	92.9
24	32.00	29.50	20	$\frac{3}{8}$	1.88	.76	186.5	2512	137.2	.89	217.3	2882	137.2	1.04	257.6	3345	126.8	1.16	286.0	3686	126.8
30	38.75	36.00	28	$\frac{3}{8}$	2.13	.88	266.1	3622	214.4	1.03	312.6	4166	207.2	1.20	366.9	4795	196.0	1.37	421.2	5427	186.4
36	46.00	42.75	32	$\frac{3}{8}$	2.38	.99	358.7	4959	327.4	1.15	418.7	5654	314.8	1.36	497.7	6572	299.9	1.58	581.9	7548	282.5
40	50.75	47.25	36	$\frac{3}{8}$	2.5	1.06	427.2	5940	406.6	1.23	497.0	6753	394.5	1.48	601.6	7965	372.7	1.72	703.4	9143	351.1
42	53.00	49.50	36	$\frac{3}{8}$	2.63	1.10	464.6	6492	458.5	1.28	542.2	7395	444.2	1.54	657.4	8720	415.4	1.78	764.1	9953	392.1
48	59.50	56.00	44	$\frac{3}{8}$	2.75	1.26	608.0	8408	555.9	1.42	687.2	9324	538.9	1.71	832.7	11001	504.4	1.96	960.8	12471	470.8

Note: Flanges drilled to "American 1914 Standard" templates; send template if other drilling is required. Bolt holes drilled $\frac{1}{8}$ in. larger than bolts. All dimensions in inches. Pipe made in 12-ft. lengths and faced $\frac{1}{4}$ in. short for gaskets; special short lengths made to order. Above are neat finished weights. Allowance must be made for variation and finish. All weights are approximate.



90° ELL



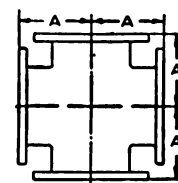
45° ELL

TABLE NO. 80. STANDARD FLANGED FITTINGS, 125 LBS. WORKING PRESSURE

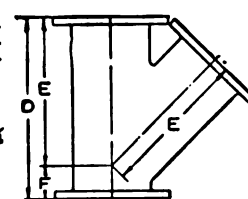
Size	3	4	6	8	10	12	14	16	18	20	24	30	36	42	48
A-A, face to face, in.	11	13	16	18	22	24	28	30	33	36	44	50	56	62	68
A, center to face, in.	5 1/2	6 1/2	8	9	11	12	14	15	16 1/2	18	22	25	28	31	34
B, center to face, long rad. ells, in.	7 1/2	9	11 1/2	14	16 1/2	19	21 1/2	24	26 1/2	29	34	41 1/2	49	56 1/2	64
C, center to face, 45° ells, in.	3	4	5	6	7 1/2	8	9 1/2	11	12 1/2	14	18	21	24	28	31
D, face to face, laterals, in.	10	12	14 1/2	17 1/2	20 1/2	24 1/2	27	30	32	35	40 1/2	49	56 1/2	64	72
E, center to face, laterals, in.	3	4	5	6	7 1/2	8	9 1/2	11	12 1/2	14	18	21	24	28	31
F, center to face, laterals, in.	6	7	8 1/2	10 1/2	12 1/2	14 1/2	16 1/2	18 1/2	20 1/2	22 1/2	26 1/2	31 1/2	36 1/2	42 1/2	48 1/2
G, face to face, reducers, in.	6 1/2	7 1/2	9 1/2	11 1/2	13 1/2	15 1/2	17 1/2	19 1/2	21 1/2	23 1/2	27 1/2	32 1/2	37 1/2	42 1/2	48 1/2
Diameter flanges, in.	7 1/2	9	11	13 1/2	16	18	21	23 1/2	25	27 1/2	32	38 1/2	46	53	59 1/2
Thickness flanges, in.	3/4	7/8	1	1 1/8	1 1/4	1 1/2	1 3/4	1 7/8	2	2 1/4	2 1/2	2 3/4	3	3 1/2	3 3/4
Minimum metal thick., body, in.	3/4	7/8	1	1 1/8	1 1/4	1 1/2	1 3/4	1 7/8	2	2 1/4	2 1/2	2 3/4	3	3 1/2	3 3/4
Bolt circle, in.	6	7 1/2	9 1/2	11 1/2	14 1/2	17	18 1/2	21 1/2	23 1/2	25	29 1/2	36	42 1/2	49 1/2	56
Number of bolts	4	8	8	8	12	12	12	16	16	20	20	28	32	36	44
Size of bolts, in.	3/8	3/8	3/8	3/8	7/8	7/8	1	1	1	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8

TABLE NO. 83. "EXTRA HEAVY" FLANGED FITTINGS, 250 LBS. WORKING PRESSURE

Size	3	4	6	8	10	12	14	16	18	20	24	30	36	42	48
A-A, face to face, in.	12	14	17	20	23	26	30	33	36	39	45	55	65	74	84
A, center to face, in.	6	7	8 1/2	10	11 1/2	13	15	16 1/2	18	19 1/2	22 1/2	27 1/2	32 1/2	37	42
B, center to face, long rad. ells, in.	7 1/2	9	11 1/2	14	16 1/2	19	21 1/2	24	26 1/2	29	34	41 1/2	49	56 1/2	64
C, center to face, 45° ells, in.	3 1/2	4 1/2	5 1/2	6	7	8	9 1/2	10	10 1/2	12	15	18	21	24	28
D, face to face, laterals, in.	14	16 1/2	21 1/2	25 1/2	29 1/2	33 1/2	37 1/2	42	45 1/2	49	57 1/2	65	74	84	94
E, center to face, laterals, in.	3	4	5	6	7 1/2	8	9 1/2	10	10 1/2	12	15	18	21	24	28
F, center to face, laterals, in.	11	13 1/2	17 1/2	20 1/2	24	27 1/2	31	34 1/2	37 1/2	40 1/2	47 1/2	55	63	72	81
G, face to face, reducers, in.	6	7	9	11	12	14	16	18	19	20	24	30	36	42	48
Diameter flanges, in.	8 1/2	10	12 1/2	15	17 1/2	20 1/2	23	25 1/2	28	30 1/2	36	43	50	57	65
Thickness flanges, in.	1 1/8	1 1/4	1 1/2	1 3/4	1 7/8	2	2 1/4	2 1/2	2 3/4	2 3/4	3	3 1/2	3 3/4	3 3/4	4
Minimum metal thick., body, in.	1 1/8	1 1/4	1 1/2	1 3/4	1 7/8	2	2 1/4	2 1/2	2 3/4	2 3/4	3	3 1/2	3 3/4	3 3/4	4
Bolt circle, in.	6 1/2	7 1/2	10 1/2	13	15 1/2	17 1/2	20 1/2	22 1/2	24 1/2	27	32	39 1/2	46	52 1/2	60 1/2
Number of bolts	8	8	12	12	16	16	20	20	24	24	32	32	40	40	48
Size of bolts, in.	3/4	3/4	3/4	3/4	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4



CROSS

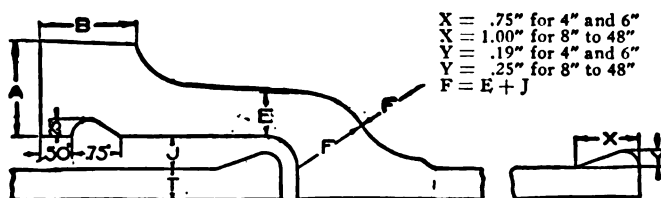


LATERAL

Cast Iron Gas Pipe

Cast iron gas pipe possesses a power of resistance against corrosion or other factors causing deterioration inherent in the material itself and not dependent solely upon addition of coatings or other artificial aids.

The specifications and tables adopted as standard by the American Gas Institute at their eighth annual meeting, which was held in Richmond, Va., in 1913, have been accepted as standard for gas pipe and specials. Write for copy of specifications.



DIMENSION DIAGRAM CAST IRON GAS PIPE

X = .75" for 4" and 6"
 X = 1.00" for 8" to 48"
 Y = .19" for 4" and 6"
 Y = .25" for 8" to 48"
 F = E + J

TABLE NO. 86. STANDARD BELL AND SPIGOT GAS PIPE

Nominal diameter, in.	Thickness, in.	Diameter sockets, in.		Depth sockets, in.		Weight, lbs. per	
		pipe	special castings	pipe	special castings	ft.	length
4	.40	5.80	5.80	4.00	4.00	19.33	232
6	.43	7.90	7.90	4.00	4.00	30.25	363
8	.45	10.05	10.05	4.00	4.00	42.08	505
10	.49	12.10	12.10	4.00	4.00	55.91	671
12	.54	14.20	14.20	4.50	4.50	73.83	886
16	.62	18.40	18.40	4.50	4.50	112.58	1351
20	.68	22.85	22.85	4.50	4.50	153.83	1846
24	.76	27.05	27.05	5.00	5.00	206.41	2477
30	.85	32.99	32.99	5.00	5.00	284.00	3408
36	.95	39.21	39.21	5.00	5.00	379.25	4551
42	1.07	45.45	45.45	5.00	5.00	497.66	5972
48	1.26	51.75	51.75	5.00	5.00	663.50	7962

Barometric Condensers

The patented features of our barometric condenser make it especially adaptable to evaporation processes where the absolute pressure in the evaporating chamber should be constant, and where the degree of vacuum should be maximum for the amount of cooling water consumed. Write for booklet.

READING IRON COMPANY

Manufacturers of Genuine Wrought Iron Pipe

READING, PA.

BOSTON, MASS.
NEW YORK, N. Y.

PHILADELPHIA, PA.
BALTIMORE, MD.

PITTSBURGH, PA.
CINCINNATI, OHIO
LOS ANGELES, CAL.

CHICAGO, ILL.
FORT WORTH, TEX.

Products

READING GENUINE WROUGHT IRON PIPE, full weight, extra heavy, and double extra heavy, in all sizes from $\frac{1}{8}$ to 20 in. outside diameter. Genuine Wrought Iron Couplings and Nipples.

Also Reading Charcoal Iron Boiler Tubes; Reading Cut Nails; Reading Genuine Wrought Iron Casing, Tubing, Line, Drive and Drill Pipe.

Heavy Marine, Engine and General Forgings; Air Furnace Castings; Cotton Compressors; Sugar Cane Mills.

Guarantee

This company guarantees that all READING wrought iron pipe is made strictly from puddled pig iron without the admixture of any foreign scrap, and that each individual length has passed the required testing and is full weight with a variation of not more than $2\frac{1}{2}\%$ below or 5% above card weight.

Marking

Every length of READING pipe has the name READING rolled in the iron as shown in the accompanying illustration, except redrawn pipe, which has the letters depressed.



FIG. 1. THE NAME READING ON EVERY LENGTH

Specifications

A highly questionable trade custom, followed for some years by many dealers in pipe, reserves the right to supply steel pipe where "wrought pipe" or "wrought iron pipe" is specified. While the use of the term "genuine wrought iron pipe" will, to some extent, overcome this deceptive practice, the most efficient method is to specify "READING Genuine Wrought Iron Pipe."

Reading Wrought Iron and Steel Compared

The radical difference between READING genuine wrought iron and steel is due entirely to the totally dissimilar methods of production. Wrought iron is refined only in the puddle furnace; steel, as used for welded pipe, is produced either by the Bessemer or open-hearth processes. To the metallurgist, this difference is apparent in comparing the relative structures of the metals; to the engineer it is most clearly demonstrated in the ability of genuine wrought iron to give satisfactory service for two to three times the average life of steel pipe under identical conditions of service. These and other differences which greatly affect the relative service rendered are briefly outlined below.

Structural Differences—During the puddling process, wrought iron receives as an inseparable component a basic silicate of protoxide of iron. This content, known as slag or cinder, thinly coats each grain of

iron, and during the subsequent rolling and re-rolling is elongated into minute threads or filaments (Fig. 2). These filaments divide the grains of ferrite (pure iron)

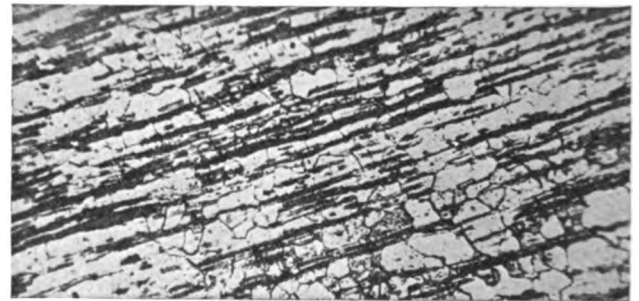


FIG. 2. PHOTO-MICROGRAPH OF A LONGITUDINAL SECTION OF READING WROUGHT IRON, MAGNIFIED 100 DIAMETERS

Black streaks indicate the fibers of corrosion-resisting siliceous slag

into clusters, thus giving to genuine wrought iron its characteristic fibrous structure. The siliceous slag, being incorrodible as glass and thoroughly distributed throughout the metal, affords unique protection to the grains of iron and diverts the progress of corrosion in directions parallel to the surface, thus greatly retarding its action and increasing the time of penetration.

In the Bessemer or open-hearth processes, the retention of a siliceous slag is impossible. Steel, therefore, is totally lacking in this protection, and consists of a solid, crystalline mass of grains of ferrite (carbonless iron), and pearlite (iron containing carbon), which offers to the progress of corrosion a direct path through the metal from surface to surface (Fig. 3). It is largely due to this structural difference that an installation of READING wrought iron pipe will render satisfactory service through a period that would destroy two if not three successive steel pipe installations.

Welds—Wrought iron gives stronger welds; its slag content is a natural flux. In the commercial welding of steel an artificial flux such as borax is used. This is impracticable, however, in the manufacture of steel pipe, thus producing a bond far less dependable than the firm, even weld of READING wrought iron pipe.

Segregation in Steel—Wrought iron is continually agitated during the puddling process and when thoroughly refined is taken from the furnace in the form

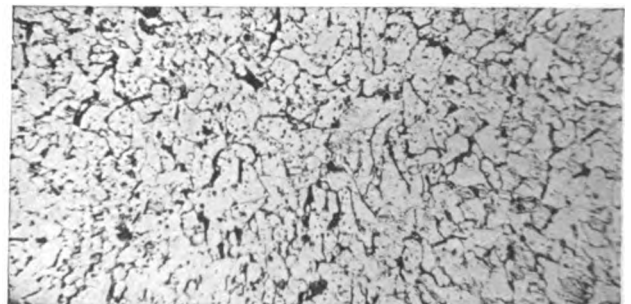


FIG. 3. PHOTO-MICROGRAPH OF A LONGITUDINAL STEEL SECTION (100 DIAMETERS) SHOWING LOW CARBON STRUCTURE AND TOTAL ABSENCE OF PROTECTING SLAG

of white-hot, semiplastic balls. Steel, on the other hand, is tapped in a liquid condition from the converter or furnace and poured into huge ingot moulds, where it is allowed to cool undisturbed. During this solidification, impurities segregate toward the slow-cooling center of the ingot, thus producing an irregularity in composition which is largely responsible for the known irregularity of steel pipe in service.

Threading—Wrought iron cuts and threads easily and cleanly. Because of its uniform, fibrous structure, special dies are not required, nor do standard dies gouge or burr the threads.

Resistance to Fatigue—Wrought iron resists continued strains, both torsional and vibratory. Its fibrous structure is not subject to crystallization.

Four Easy Tests to Distinguish Genuine Wrought Iron Pipe

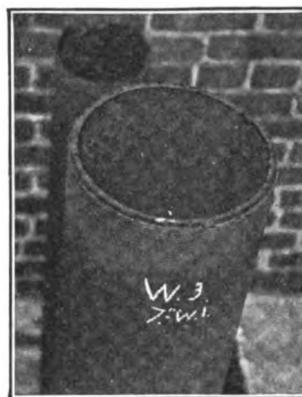
File Test—File a bright, smooth surface about 2 in. square on the piece of pipe to be inspected. If the bright surface shows fine hair lines running parallel to length of pipe it is wrought iron, for these hair lines are fibers of the siliceous slag. If, on the other hand, the surface does not show these lines the material is steel.

Threading Test—Examine cuttings while the pipe is being threaded. If they are in long coils, the pipe is steel; if they are broken into short chips, the pipe is wrought iron.

Galvanizing Test—Hammer a piece of galvanized pipe repeatedly. If, as it flattens out, the galvanizing flakes off freely, the pipe is steel. If, on the other

hand, the galvanizing adheres firmly to the pipe, it is wrought iron.

Roll Mark Test—Every length of Reading wrought iron pipe has the word "READING" rolled in the iron, except redrawn pipe, which has the letters depressed. The name "READING" insures genuine wrought iron pipe, with its life two or three times that of steel pipe.



Front Pipe is Black Wrought Iron, Installed 1907; Good as New. Rear Pipe is Black Steel, Installed 1907; Scaling Badly and About 50% Gone



Black Steel Pipe Installed 1907; Scaling Badly and About 75% Gone

UNRETouched ILLUSTRATIONS OF VENT PIPES ON JOHN WANAMAKER STORE, PHILADELPHIA, PA.

Photos taken during 1920

READING X STRONG AND XX STRONG GENUINE WROUGHT IRON PIPE

Size, in.	List price per ft.	Diameters, in.		Thickness, in.	Weight per ft., plain ends, lbs.	Hydrostatic test, lbs.
		External	Internal			

EXTRA STRONG, BLACK AND GALVANIZED

Size, in.	List price per ft.	Diameters, in.		Thickness, in.	Weight per ft., plain ends, lbs.	Hydrostatic test, lbs.
		External	Internal			
1 1/2	\$0.12	.405	.210	.098	.314	750
2	.07 1/2	.540	.295	.122	.535	750
2 1/2	.07 1/2	.675	.417	.129	.738	750
3	.11	.840	.539	.151	1.087	750
3 1/2	.15	1.050	.735	.157	1.473	750
4	.22	1.315	.949	.183	2.171	750
4 1/2	.30	1.660	1.269	.195	2.996	1500
5	.36 1/2	1.900	1.491	.204	3.631	1500
6	.36 1/2	2.375	1.929	.223	5.022	2500
7	.77	2.875	2.311	.282	7.661	2000
8	1.03	3.500	2.887	.306	10.252	2000
9	1.25	4.000	3.350	.325	12.505	2000
10	1.50	4.500	3.811	.344	14.983	2000
11	1.80	5.000	4.275	.363	17.611	1800
12	2.08	5.563	4.797	.383	20.778	1800
13	2.86	6.625	5.743	.441	28.573	1800
14	3.81	7.625	6.603	.511	38.048	1500
15	4.34	8.625	7.604	.510	43.388	1500
16	4.90	9.625	8.604	.510	48.728	1500
17	5.48	10.750	9.729	.510	54.735	1200
18	6.10	11.750	10.729	.510	60.075	1100
19	6.55	12.750	11.729	.510	65.415	1100

DOUBLE EXTRA STRONG, BLACK AND GALVANIZED

Size, in.	List price per ft.	Diameters, in.		Thickness, in.	Weight per ft., plain ends, lbs.	Hydrostatic test, lbs.
		External	Internal			
1 1/2	\$0.32	.840	.226	.307	1.714	750
2	.35	1.050	.413	.318	2.440	750
2 1/2	.37	1.315	.576	.369	3.659	750
3	.52 1/2	1.660	.874	.393	5.214	2200
3 1/2	.65	1.900	1.078	.411	6.408	2200
4	.91	2.375	1.480	.447	9.029	3000
4 1/2	1.37	2.875	1.742	.567	13.695	3000
5	1.86	3.500	2.270	.615	18.583	3000
6	2.30	4.000	2.697	.651	22.850	2500
7	2.76	4.500	3.119	.690	27.541	2500
8	3.26	5.000	3.546	.727	32.530	2000
9	3.86	5.563	4.028	.768	38.552	2000
10	5.32	6.625	4.857	.884	53.160	2000
11	6.35	7.625	5.835	.895	63.079	2000
12	7.25	8.625	6.835	.895	72.424	2000

Extra strong and double extra strong pipe will be shipped in random lengths and with plain ends unless otherwise ordered.

All weights and dimensions are nominal.

Random lengths extra strong and double extra strong pipe are considered to be 12 to 20 ft.

If fitted with threads and couplings, an extra charge will be made above regular. When extra strong and double extra strong pipe is ordered with threads and couplings, regular line pipe couplings will be furnished, unless otherwise specified.

For cut lengths, an extra charge will be made above random lengths. For galvanized or tar coated pipe, an extra charge will be made above black.

All Double X Strong Pipe made from a solid sheet—not telescoped.

READING STANDARD GENUINE WROUGHT IRON PIPE BLACK AND GALVANIZED

Size, in.	List price per ft.	Diameters, in.		Thickness, in.	Weight per ft., plain ends	Thds. per in.	Lgth. of thread, in.	Taper per foot, in.	Hydrostatic test, lbs.
		Ex-ternal	In-ternal						
1 1/2	\$0.05 1/2	.405	.266	.070	.244	.245	27	1 1/2	750
2	.06	.540	.360	.090	.424	.425	18	1 1/2	750
2 1/2	.06	.675	.489	.093	.567	.568	18	1 1/2	750
3	.08 1/2	.840	.617	.111	.850	.852	14	1 1/2	750
3 1/2	.11 1/2	1.050	.819	.115	1.130	1.134	14	1 1/2	750
4	.17	1.315	1.043	.136	1.678	1.684	11 1/2	1	750
4 1/2	.23	1.660	1.374	.143	2.272	2.281	11 1/2	1	750
5	.27 1/2	1.900	1.604	.148	2.717	2.731	11 1/2	1	750
6	.27 1/2	2.375	2.060	.158	3.652	3.678	11 1/2	1	1000
7	.58 1/2	2.875	2.460	.208	5.793	5.819	8	1 1/2	1000
8	.76 1/2	3.500	3.059	.221	7.575	7.616	8	1 1/2	1000
9	.92	4.000	3.538	.231	9.109	9.202	8	1 1/2	1000
10	1.09	4.500	4.016	.242	10.790	10.889	8	1 1/2	1000
11	1.27	5.000	4.496	.252	12.538	12.642	8	1 1/2	1000
12	1.48	5.563	5.036	.263	14.617	14.810	8	1 1/2	1000
13	1.92	6.625	6.053	.286	18.974	19.185	8	1 1/2	1000
14	2.38	7.625	7.010	.307	23.544	23.769	8	1 1/2	1000
15	2.50	8.625	8.059	.283	24.696	25.000	8	1 1/2	800
16	2.88	8.625	7.967	.329	28.554	28.809	8	1 1/2	1000
17	3.45	9.625	8.927	.349	33.907	34.188	8	1 1/2	900
18	3.20	10.750	10.181	.284	31.201	32.000	8	2 1/2	600
19	3.50	10.750	10.124	.313	34.240	35.000	8	2 1/2	800
20	4.12	10.750	10.005	.372	40.483	41.132	8	2 1/2	900
21	4.63	11.750	10.985	.382	45.557	46.247	8	2 1/2	800
22	4.50	12.750	12.077	.336	43.773	45.000	8	2 1/2	600
23	5.07	12.750	11.985	.382	49.562	50.706	8	2 1/2	800
24	5.60	14.000	13.250	.375	53.510	55.824	8	3	700
25	6.10	15.000	14.250	.375	57.437	60.375	8	3	700
26	6.50	16.000	15.250	.375	61.364	64.500	8	3	600

Furnished with threads and couplings and in random lengths unless otherwise ordered.

All weights and dimensions are nominal.

Weight per foot of pipe with threads and couplings is based on a length of 20 ft., including the coupling, but shipping lengths of small sizes will usually average less than 20 ft.

Permissible variation in weight is 2 1/2% below and 5% above weights given in tables.

All weights are figured on the basis of 1 cu. in. of wrought iron weighing .2778 lb.

All pipe threaded to Briggs' standard gauges as made by Pratt & Whitney Co., Hartford, Conn.

For pipe smoothed, an extra charge will be made above random lengths. For pipe smoothed on the inside (known as plugged and reamed) an extra charge will be made above standard pipe.

For galvanized or coated pipe an extra charge will be made above black. When ordering sizes 8 to 12 in., please state weight of pipe wanted.

A. M. BYERS COMPANY

Genuine Wrought Iron Pipe, Couplings and Nipples

PITTSBURGH, PA.

Products

GENUINE WROUGHT IRON PIPE.

Also manufacturers of Couplings and Nipples, Tubing, Casing, Line Pipe, Drill and Drive Pipe.

Guarantee

The International Society for Testing Materials, in 1912, suggested the following definition of wrought iron:

Wrought Iron—Malleable iron which is *aggregated from pasty particles without subsequent fusion*, and contains so little carbon that it does not harden usefully when cooled rapidly.

Remarks—Commercial wrought iron, though essentially made direct from the ore, is usually made from cast iron by such removal of its carbon and silicon as to convert it into pasty particles, and by squeezing these together in a bath of cinder or slag into a coherent mass, which *retains permanently an important quantity of that slag*.

The most important features of this definition, with its appended "Remarks," have been italicized in the above. The Byers guarantee quoted below, under which their pipe is sold, is an amplification of this definition, embodying additional provisions to safeguard against material not in keeping with the highest recognized quality of wrought iron. These additional provisions are italicized in the following:

"All Byers pipe is guaranteed to be produced from genuine wrought iron, aggregated from a *solidifying mass of pasty particles of highly refined metal with which, without subsequent fusion, are incorporated a minutely and uniformly distributed quantity of silicate slag.*"

There is guaranteed by the above, a product which conforms to certain chemical and physical characteristics. The base metal must be refined to the requisite degree of purity as indicated by the final amount of contained ingredients; and it must have incorporated in a proper manner the desired proportion of slag of the quality essential for the production of good wrought iron. Finally, the process must be such as to *preclude the possibility of segregation of impurities, common to steel making.*

Properties of Byers Pipe

Resistance to Vibration—By exaggerating differences, wrought iron pipe may be likened to a wire rope and steel to a stick of granite. The fibrous structure makes wrought iron extremely resistant to the constant vibration and shocks to which it is subjected in all large buildings, power plants, on railroad cars, etc.

Resistance to Shocks and Expansion—On account of its tough, fibrous structure, Byers pipe is able to withstand the severe shocks to which pipe in industrial service is continually subjected, such as water-hammer, etc. In addition, its low expansion co-efficient of expansion enables it to stand the sudden changes in temperature incident to such service with a minimum strain at the joints, thus reducing the possibility of pulling away at the threads, a very common occurrence when cheaper pipe is used.

Cutting and Threading—The softness of the metal, its high purity and freedom from hard spots, make Byers pipe not only easy to cut and thread, but insure clean, sharp threads and save materials, time and tools. Owing to the perfect threads obtained, the joints are strong and permanently tight. These advantages mean a low fabricating and installation cost and are often sufficiently important to offset the higher initial cost of the pipe itself.

Resistance to Corrosion—Probably no other single quality of Byers pipe has contributed so greatly to its reputation as its large factor of immunity from corrosion, so characteristic of old-fashioned genuine wrought iron. The president of the Western Union Telegraph Co. a few years ago stated in a report to the United States Department of Agriculture: "Bessemer or open hearth steel wire will rust or deteriorate much more rapidly than iron wire, in all probability three times as rapidly."

Extended service records on Byers pipe lead to a similar conclusion; its useful life varying from two to ten times greater than that of cheaper pipe. Lists of specific cases will be sent on request.

Galvanized and Coated Pipe—Wrought iron has a rough surface to which protective coatings adhere very firmly. Byers pipe is furnished galvanized by the hot metal process, only the highest grade prime western spelter being used and a coating applied which is about 40% heavier than that of the best steel pipe. See Byers specifications following.

How to Specify Pipe

Steel pipe is known in the trade as "wrought pipe." This term has confused dealers and contractors to such an extent that many of them make no distinction between wrought iron pipe and wrought pipe, insisting on their right to furnish steel pipe on specifications calling for "wrought iron" pipe. To avoid such substitution, engineers and purchasers should specify

- (1) *Genuine Wrought Iron Pipe*, or
- (2) *Byers Pipe* (or approved equal).

The word Byers rolled into the pipe you use, is the surest guarantee of it being made of genuine wrought iron of highest quality.

Literature

Bulletin No. 26A—"What is Wrought Iron?"

Bulletin No. 30—"An Investigation of the Corrosion of Iron, Steel and Brass Pipe in Hot and Cold Water Supply Service."

Bulletin No. 32—"Investigations of the Relative Corrosion of W. I., Steel and C. I. Pipe in House Drainage Service."

Bulletin No. 34—"The Corrosion of Piping in Refrigeration Service."

Bulletin No. 38—"The Installation Cost of Pipe." (Itemized Cost of Pipe Systems of every variety.)

These and other bulletins will be sent free on request.

AMERICAN SPIRAL PIPE WORKS

GENERAL OFFICE AND WORKS

P. O. Box 485

CHICAGO, ILL.

EASTERN OFFICE: 50 Church Street, NEW YORK

Products

TAYLOR'S SPIRAL RIVETED PIPE, Galvanized or Asphalting; LARGE DIAMETER LAP-WELDED STEEL PIPE; FORGED STEEL PIPE FLANGES; FORGED STEEL BOLTED JOINTS; SEAMLESS FORGED STEEL BOILER NOZZLES; FLEXIBLE BALL JOINTS; CORRUGATED BOILER FURNACES.

Also manufacturers of Flanged Fittings; Gate, Straightway and Foot Valves; Exhaust Heads; Hydraulic Mining Giants; Welded Tanks, etc.

Taylor's Spiral Riveted Pipe

Made of sheet steel strip, wound into helical shape with one edge overlapping the other for riveting the seam. Metal to metal contact at spiral seam. Steel stretched on outer lap slightly offset to insure smoothness on inside. Riveting is done by compression or squeezing under enormous pressure (not percussion or hammer-

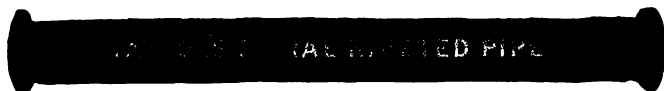


FIG. 1. SPIRAL RIVETED PRESSURE PIPE

ing), thus completely filling rivet holes with slight countersink. Hydraulic bursting pressure tests have frequently shown the seam to be the strongest part of pipe. Recommended for high pressure hydro-electric lines, exhaust steam and condenser piping for industries generally; water supply lines, water works systems, pumping mains, distribution work, producer gas lines, etc.

Lap-welded Steel Pipe (Forge Welded)

Made from best quality open hearth steel, this pipe is of 12-in. to 96-in. diameter, $\frac{1}{4}$ -in. to $1\frac{1}{2}$ -in. thickness, having a tensile strength of 50,000 to 60,000 lbs. per sq. in. A reliable and uniform weld is accomplished by

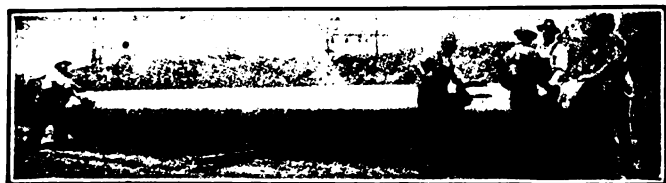


FIG. 2. LAP-WELDED STEEL PIPE

forging after heating in gas furnaces. Furnished complete with connections and bends. Recommended for hydro-electric power plants, water supply and intake mains, gas work, shore pipe, dredging pipe, dredging spuds, welded pontoons, large diameter welded drums, tanks, cylinders and shells.

Forged Steel Bolted Joints

For connecting pipe. Unbreakable in handling,

transportation or use. Joints allow slight deflection without leakage and take care of expansion and contraction of pipe. Suitable for highest pressures. By using short lengths of pipe, long radius bends are possible. (Fig. 3.)



FIG. 3. FORGED STEEL BOLTED JOINT

Forged Steel Pipe Flanges

Being strictly forged steel, they may be attached securely and rigidly to pipe by use of power riveters, making an absolutely tight joint, and eliminating possibility of leaks. (Fig. 4.) Forged from best steel, they can not be broken in transit or installation. Furnished in spiral pipe or American standard.

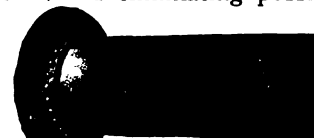


FIG. 4. FORGED STEEL FLANGE FOR RIVETED PIPE

Taylor's Seamless Forged Steel Boiler Nozzles

For outlets on boilers and tanks, furnished for pipe sizes $1\frac{1}{2}$ in. to 10 in., saddle flange bent to required circle. Absolutely free from sweat leaks.

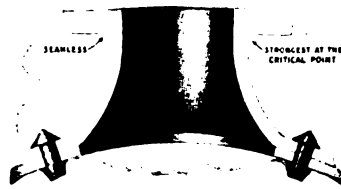


FIG. 5. SEAMLESS STEEL BOILER NOZZLE

Flexible Ball Joints

For submerged pipe lines, allowing 20° deflections in any direction. Packing ring may be tightened or entire joint repacked without affecting clamping ring that prevents joint from pulling apart.

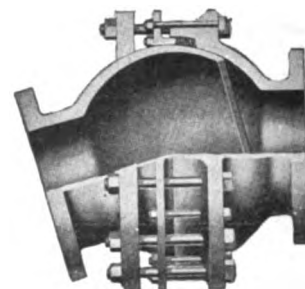


FIG. 6. FLEXIBLE BALL JOINT

Corrugated Boiler Furnaces

For internally fired boilers, both land and marine types. Made exactly to requirements, in accordance with specifications of U. S. Board of Supervising Inspectors, Lloyd's or American Bureau of Inspection.



FIG. 7. CORRUGATED BOILER FURNACES READY FOR SHIPMENT

EAST JERSEY PIPE COMPANY

OFFICES
7 Dey Street
NEW YORK, N. Y.

Products

LOCK-BAR STEEL PIPE.

Also manufacturers of Riveted Steel Pipe; Dredge Pipe; Pontoon Pipe; Shore Pipe; Tanks; Standpipes; Steel Linings; Plate Work; Tube Mills.

Advantages of Lock-bar Steel Pipe

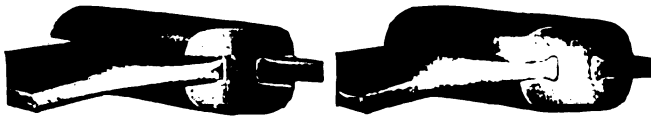
The relative advantages of different forms of pipe are determined by comparing their carrying capacities, strength, durability, and cost.

Lock-bar pipe has a carrying capacity 10% to 15% greater than riveted steel and slightly greater than cast iron, because of its smooth interior unobstructed by rivets. It has a strength at the joint of 100% or equal to the plate itself, as hereinafter shown.

Its durability and relatively small cost have been amply demonstrated by actual use for many years.

Description of Lock-bar Steel Pipe

"Lock-bar steel pipe is made by up-setting the edges of the plates and connecting them by a lock-bar in the shape of an H going over the opposite edges and being forced down over them by hydraulic pressure. This takes the place of the riveting in the longitudinal joints. The circular joints may be made by riveting or otherwise, as for riveted pipe. While double riveting

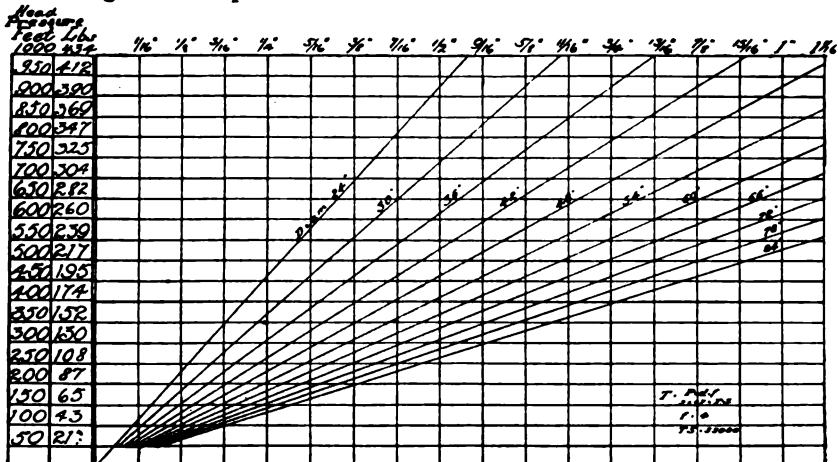


Before Closing After Closing
FIG. 1. LOCK-BAR JOINT

develops only about 72% of the strength of the steel plate, the lock-bar actually develops 100%."—*American Civil Engineers Pocket Book*, p. 959.

Strength of Joint

The lock-bar joint is 100% efficient or equal to the strength of the plate itself. It is therefore possible to use in many instances lock-bar pipe of a thickness of plate $\frac{1}{8}$ in. less than the thickness required in riveted or welded pipe where the joint efficiency is less than the strength of the plate.



Double Riveted Pipe

COMPARATIVE CHARTS SHOWING SAFE WORKING PRESSURES FOR RIVETED AND LOCK-BAR PIPES BASED UPON

$$\text{FORMULA } T = \frac{PFD}{2TS}; T.S. = 55,000 \text{ LBS.}; F = \text{FACTOR OF SAFETY } 4$$

Hydraulic Test on 42-inch Pipe

On Jan. 2, 1909, official tests were conducted by the Robert W. Hunt Co. for the City of Springfield, Mass., on a 42-in. diameter, $\frac{1}{8}$ -in. plate lock-bar pipe under pressure of 1050 lbs. per sq. in. (Fig. 2). The metal of the plate was stretched over 4 in. in circumference without injury or leakage along the lock-bar joints. Higher pressure was not possible because of blowing out riveted pads at gage and inlet, as shown below. At this pressure, the pipe was actually exceeding by 765 lbs. per sq. in. its normal working pressure.



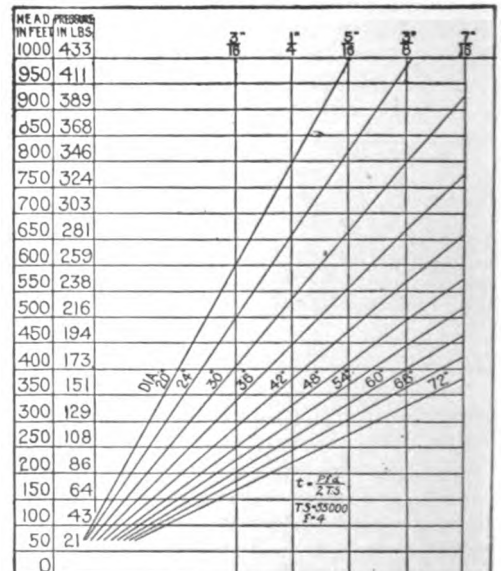
FIG. 2. HYDRAULIC TEST ON 42-INCH PIPE
Showing riveted pads blown out at gage and inlet; lock-bar joint remaining tight

Carrying Capacity

By reason of its exceptionally smooth interior, lock-bar pipe has a slightly greater carrying capacity than cast iron pipe, and from 10% to 15% greater carrying capacity than riveted steel pipe, the interior of which is necessarily obstructed at frequent intervals by the projection of rings of rivets.—*See American Civil Engineers Pocket Book*, p. 959; *Fry's Civil Engineers Pocket Book*, pp. 1162-1163.

Sizes

Lock-bar pipe is made in diameters from 20 to 72 in., inclusive, and thicknesses of plate from $\frac{1}{8}$ to $\frac{1}{2}$ in., inclusive.



Lock-bar Pipe

Lengths

Standard lengths, except where necessary to fit pipe to plan or profile of line, or where sizes of plates obtainable impose other limitations, are 30-ft. laying lengths, the most economical for handling and transporting.

Joints

In all sizes above 24 in., where diameter is sufficient to permit inside rivet insertion and calking, patented riveted taper joints (Fig. 3) are employed. For this joint the pipe is made sufficiently tapered to permit insertion of one pipe in the slightly enlarged end of the contiguous pipe, the two pipes being connected in ordinary practice by one row of rivets, after which the joint is calked both inside and outside in a manner similar to the seams of a boiler.

In some instances buttstrap joints are employed.

Special attention is called to the new patented high pressure coupling and also the modification of this coupling for submarine work. Lock-bar pipe with plain ends is furnished for use with these couplings, which can be furnished in all sizes 20 to 48 in. in diameter. The lock-bar on the outside of the pipe is cut down and the pipe welded and smoothed a sufficient distance from the end to permit the pipe to fit into the coupling.

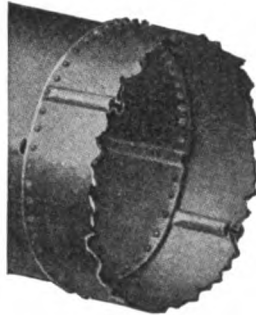


FIG. 3. RIVETED TAPER JOINT

Specifications for Lock-bar Pipe

Planing and Up-setting—The longitudinal edges of plates shall be planed to proper dimension and edges up-set to a sufficient degree to form necessary shoulder for engaging lock-bar. The ends of the plates shall be bevel sheared.

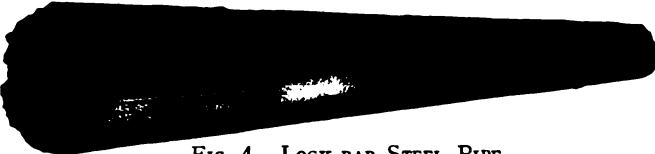


FIG. 4. LOCK-BAR STEEL PIPE

Crimping and Rolling—The longitudinal edges of plates shall be crimped to proper radius, so that when plates are rolled edges entering lock-bar shall not be damaged by rolling. After crimping, plates shall be cold rolled to diameter of cylinder of pipe.

Lock-bars—The lock-bars shall be made from a grade of steel and in accordance with certain specifications which experience has shown best designed for this usage.

Pressing—Plates and lock-bars shall be assembled and clamped together and lock-bars pressed down over up-set edges of the plates by a hydraulic press exerting a pressure of at least 350 tons per lin. ft. of pipe.

Finishing—After the bars have been pressed, ends of bars shall be trimmed to edge of plate to conform to bevel of edge of plate.

Testing—Each section of pipe shall be tested in a hydraulic testing machine to at least one and one-half times the working pressure, which pressure shall be maintained until inspection has been made of entire length of lock-bar joint. Any pipe showing any signs of leakage or weakness at any point shall be returned and re-pressed.

General Specifications for All Pipe

Material used and method of manufacture shall conform to the following detailed specifications, although slight variations from exact specifications may be permitted where, in the judgment of purchaser's inspector, such variations do not affect strength, durability or efficiency.

Inspection—All materials entering into manufacture of said pipe and manufacture of pipe itself shall be subject to inspection by purchaser or his duly authorized representative. All steel shall be inspected by purchaser's inspector at mill. Steel plates shall be lifted to a sufficient height or angle to permit proper inspection of both sides and all plates showing scales, blisters, laminations, burns, or imperfection of any description shall be rejected.

Quality of Metal—Pipe, unless otherwise specified, shall be made of steel plates manufactured by open hearth process which conform to the following requirements:

Tensile Strength—Ultimate tensile strength of steel plates shall be between 55,000 and 65,000 lbs. per sq. in. Form of all test specimens, unless otherwise specified, shall be in accordance with "Standard Specifications for Structural Steel for Bridges" as adopted on August 16, 1909, by American Society for Testing Materials.

Elastic Limit—The elastic limit shall not be less than one-half ultimate tensile strength. The elongation shall not be less than 25% in 8 in. with a reduction in area of not less than 50%.

Rolling—Material shall be rolled true, and billets from which said material is rolled shall be free from seams and cracks. For the purpose of excluding inferior material, there shall be sheared from top of ingot sufficient discard to obtain sound steel.

Punching Test—Specimens for punching test shall be 1¼ in. wide, and not less than 10 in. long; a row of not less than 8 holes ¼ in. in diameter, spaced 1¼ in. between centers, shall be punched while plate is cold, without causing any cracks.

Drifting Test—Specimens for drifting tests shall be 3 in. wide and not less than 5 in. long; not less than 2 holes ¼ in. in diameter, spaced 2 in. between centers and 1½ in. from edges, shall be punched and then enlarged cold by blows from a sledge hammer upon a drifting pin until said holes are at least 1¼ in. in diameter, without causing any cracks.

Bending Test—The bending test specimens shall be cut lengthwise and crosswise from sheets, and shall not be less than 6 in. long and 1 in. wide. When cold they shall be bent 180° flat upon themselves without showing any signs of fracture on convex side of bent portion.

Additional Tests—Plates while cold must admit of hammering or scarfing to a fine edge without fracture. Test pieces must stand quenching, forging and other tests to prove fully their temper, soundness, and fitness for use in manufacture of pipe.

Perfect Plates—Plates shall be free from laminations, cinders and any other surface defects. They shall be fully up to required thickness at edges, and any plates which shall be found to be more than 5% short of the required thickness at any point shall be rejected. Not over 5% of plates shall be short of full required thickness at any point. Plates must be rolled flat and sheared as accurately as possible (in no case shall any plates be short of specified dimensions) and must in all respects be in good merchantable condition.

Specimens and Rejections—General qualifications shall be determined from one set of tests from each heat or melt; but any plate which shows defect during the process of punching, bending or riveting shall be rejected notwithstanding previous satisfactory tests of test pieces. Failure of test pieces to conform to specifications shall cause rejection of entire heat or melt from which samples were obtained.

Before proceeding with manufacture of pipe, contractor will prepare and submit to purchaser for his approval shop drawings showing proposed layout.

Punching—Rivet holes shall be punched with sharp clean punches and dies so as to cut holes clean and leave no burr on underside of plates.

Specifications for Coating—Material used for coating pipe shall be a specially prepared mineral rubber asphalt mixture.

Pipe section shall be heated in suitable oven to a temperature of not less than hereinafter specified for the bath. Pipe section shall then be dipped vertically in the bath of mineral rubber coating maintained at a temperature of 350° Fahr. or more and of sufficient depth to allow pipe to be entirely submerged, and it shall receive a coating of not less than ½ in. in thickness. Coating must be free from blisters and bubbles; it must strongly adhere to pipe under all circumstances, and must not become soft enough to flow at a temperature of 150° Fahr., nor brittle enough to crack or scale off in freezing temperature. After pipe sections have been removed from bath, they shall be set in a vertical position while cooling.

Loading—After coating has become sufficiently hard, pipe shall be loaded on suitable cars provided with wood saddles, cut to proper radius for pipe to rest on. All saddles or bolsters, as well as all side stakes on cars which come in contact with pipe, shall be protected with pads of burlap or other suitable material of sufficient thickness to prevent rubbing or chafing of coating. Entire load to be blocked and wired on cars in best possible manner, to prevent, as far as possible, shifting in transit and injury to coating.

Burlap Wrapping—After pipe has been dipped in mineral rubber coating and coating has sufficiently set to prevent flow in subsequent operations, it may, at the purchaser's option, be wrapped with 10-oz. Calcutta burlap or equal, which shall be cut into strips 18 in. wide and applied in accordance with the particular specifications of the EAST JERSEY PIPE COMPANY.

THE YOUNGSTOWN SHEET & TUBE COMPANY

GENERAL OFFICES AND WORKS
YOUNGSTOWN, OHIO

SALES OFFICES

NEW YORK, N. Y., 30 Church Street
PHILADELPHIA, PA., Pennsylvania Building
ATLANTA, GA., 1514 Healey Building
PITTSBURGH, PA., 1626 Oliver Building
CHICAGO, ILL., 1563 McCormick Building
CLEVELAND, OHIO, Leader-News Building

DENVER, COLO., First National Bank Building
SAN FRANCISCO, CAL., 604 Mission Street
DALLAS, TEX., Dallas County State Bank Building
SEATTLE, WASH., Central Building
ST. LOUIS, MO., 1139 Olive Street
DETROIT, MICH., Dime Savings Bank Building

BOSTON, MASS., 120 Franklin Street

EXPORT SALES AGENT: CONSOLIDATED STEEL CORPORATION, 25 Broadway, NEW YORK, N. Y.

Products

"YOUNGSTOWN" PIPE.

"YOUNGSTOWN COPPEROID" STEEL SHEETS.

"BUCKEYE" ELECTRICAL CONDUIT.

"REALFLEX" STEEL ARMORED FLEXIBLE CABLE.

Also manufacturers of "Youngstown" Sheared Plates, "Youngstown" Steel Bars, "Youngstown" Steel Reinforcing Bars.

The "Youngstown" Plant

This company operates one of the most modern and extensive steel plants in the world, mining its own ores and coal, producing its own coke, and controlling every step in the many processes necessary to manufacture a large number of products, among which those listed above are of especial interest to engineers.

"Youngstown" Pipe

This company operates

"YOUNGSTOWN" STEEL PIPE

eleven tube mills, with an average yearly capacity of 650,000 tons of pipe, including all standard sizes and weights, as well as many different kinds of pipe for special purposes.

Attention is called particularly to the uniform high quality of "Youngstown" pipe and its wide use for plumbing and heating as well as power installations.

"Youngstown" pipe is made of the best steel possible to produce for this purpose. Its superiority and relatively low cost have so increased its popularity that the capacity of the mills producing it has gradually been increased until this is now 650,000 tons per year.

For the convenience of engineers, specifications and other data for "Youngstown" steel and iron pipe are appended, and in connection with these THE YOUNGSTOWN SHEET & TUBE COMPANY desires to emphasize the extraordinary care used in the processes by which this pipe is manufactured.



"YOUNGSTOWN" STANDARD EXTRA STRONG AND DOUBLE EXTRA STRONG STEEL PIPE
All Weights and Dimensions Are Nominal

Size, in.	List price per foot	Diameters, in.		Thick- ness, in.	Weight per foot, lbs.		Threads per in.
		External	Internal		Plain ends	Threads and couplings	
FULL STANDARD WEIGHT—BLACK AND GALVANIZED*							
1/8	\$.05 1/2	.405	.269	.068	.244	.245	27
1/4	.06	.540	.364	.088	.424	.425	18
3/8	.06	.675	.493	.091	.567	.568	18
1/2	.08 1/2	.840	.622	.109	.850	.852	14
3/4	.11 1/2	1.050	.824	.113	1.130	1.134	14
1	.17	1.315	1.049	.133	1.678	1.684	11 1/2
1 1/4	.23	1.660	1.380	.140	2.272	2.281	11 1/2
1 1/2	.27 1/2	1.900	1.610	.145	2.717	2.731	11 1/2
2	.37	2.375	2.067	.154	3.652	3.678	11 1/2
2 1/2	.58 1/2	2.875	2.469	.203	5.793	5.819	8
3	.76 1/2	3.500	3.068	.216	7.575	7.616	8
3 1/2	.92	4.000	3.548	.226	9.109	9.202	8
4	1.09	4.500	4.026	.237	10.790	10.889	8
4 1/2	1.27	5.000	4.506	.247	12.538	12.642	8
5	1.48	5.563	5.047	.258	14.617	14.810	8
6	1.92	6.625	6.065	.280	18.974	19.185	8
7	2.38	7.625	7.023	.301	23.544	23.769	8
8	2.50	8.625	8.071	.277	24.696	25.000	8
8	2.88	8.625	7.981	.322	28.554	28.809	8
9	3.45	9.625	8.941	.342	33.907	34.188	8
10	3.20	10.750	10.192	.279	31.201	32.000	8
10	3.50	10.750	10.136	.307	34.240	35.000	8
10	4.12	10.750	10.020	.365	40.483	41.132	8
12	4.50	12.750	12.090	.330	43.773	45.000	8
12	5.07	12.750	12.000	.375	49.562	50.706	8
13	5.60	14.000	13.250	.375	54.568	55.824	8
14	6.10	15.000	14.250	.375	58.573	60.375	8
15	6.50	16.000	15.250	.375	62.579	64.500	8

Size, in.	List price per foot	Diameters, in.		Thick- ness, in.	Weight per foot, lbs., plain ends
		External	Internal		
EXTRA STRONG PIPE—BLACK AND GALVANIZED*†					
1/8	\$0.12	.405	.215	.095	.314
1/4	.07 1/2	.540	.302	.119	.535
3/8	.07 1/2	.675	.423	.126	.738
1/2	.11	.840	.546	.147	1.087
3/4	.15	1.050	.742	.154	1.473
1	.22	1.315	.957	.179	2.171
1 1/4	.30	1.660	1.278	.191	2.996
1 1/2	.36 1/2	1.900	1.500	.200	3.631
2	.50 1/2	2.375	1.939	.218	5.022
2 1/2	.77	2.875	2.323	.276	7.661
3	1.03	3.500	2.900	.300	10.252
3 1/2	1.25	4.000	3.364	.318	12.505
4	1.50	4.500	3.826	.337	14.983
4 1/2	1.80	5.000	4.290	.355	17.611
5	2.08	5.563	4.813	.375	20.778
6	2.86	6.625	5.761	.432	28.573
7	3.81	7.625	6.625	.500	38.048
8	4.34	8.625	7.625	.500	43.388
9	4.90	9.625	8.625	.500	48.728
10	5.48	10.750	9.750	.500	54.735
11	6.10	11.750	10.750	.500	60.075
12	6.55	12.750	11.750	.500	65.415
DOUBLE EXTRA STRONG PIPE—BLACK AND GALVANIZED*††					
1/8	\$0.32	.840	.252	.294	1.714
1/4	.35	1.050	.434	.308	2.440
1	.37	1.315	.599	.358	3.659
1 1/4	.52 1/2	1.660	.896	.382	5.214
1 1/2	.65	1.900	1.100	.400	6.408
2	.91	2.375	1.503	.436	9.029
2 1/2	1.37	2.875	1.771	.552	13.695
3	1.86	3.500	2.300	.600	18.583
3 1/2	2.30	4.000	2.728	.636	22.850
4	2.76	4.500	3.152	.674	27.541
4 1/2	3.26	5.000	3.580	.710	32.530
5	3.86	5.563	4.063	.750	38.552
6	5.32	6.625	4.897	.864	53.160
7	6.35	7.625	5.875	.875	63.079
8	7.25	8.625	6.875	.875	72.424

Furnished with threads and couplings and in random lengths unless otherwise ordered.

For pipe smoothed on the inside, known as reamed and drifted, an

Furnished with threads and couplings and in random lengths unless otherwise ordered.

For pipe smoothed on the inside, known as reamed and drifted, an extra charge will be made above standard pipe.

For cut lengths, an extra charge will be made above random lengths. For galvanized or coated, an extra charge will be made above black. *The permissible variation in weight is 5% above and 5% below. †The permissible variation in weight is 10% above or 10% below. ‡Furnished with plain ends and in random lengths, unless otherwise ordered. Random length of Extra Strong and Double Extra Strong pipe is considered to be 12 to 22 ft.; we to have the privilege, however, of supplying not exceeding 5% of the total order in lengths of from 6 to 12 ft. For pipe fitted with threads and couplings, an extra charge will be made above plain ends.

Specifications for "Youngstown" Steel Pipe

For the convenience of engineers the following specifications for steel pipe are submitted:

Material—All "Youngstown" steel pipe shall be made of soft weldable steel of uniformly good quality. This steel to be particularly adaptable to the requirements for wrought pipe, and sufficient crop shall be cut from the top of each ingot to secure solid metal in the skelp.

Properties—The steel from which the pipe is made shall have approximately the following physical properties:

Tensile strength, not less than 50,000 lbs.
Elastic limit, not less than one-half tensile.
Elongation in 8 in., not less than 20%.
Reduction in area, not less than 50%.

Test Specimens—Test specimens for determining physical properties shall be cut from skelp or finished pipe.

Crushing Test—When required, cross sections cut from any pipe shall stand crushing down until the inside walls are three times the thickness of the wall from each other without showing cracks on the outside of the bend; except that, in the case of butt-welded pipe, any fracture at the weld must give evidence of having been firmly welded.

Bend Test—When required, a test specimen cut lengthwise from skelp or finished pipe and filed smooth on the edges shall bend through an angle of 180°, with an inner diameter equal to the thickness of the material, without fracture.

Hydrostatic Test—All sizes shall be tested at mill to an internal pressure, as shown in the following table:

¾ to 2 in., butt-weld, 700 lbs.
2½ and 3 in., butt-weld, 800 lbs.
Up to 8 in., lap-weld, 1000 lbs.
9 and 10 in., lap-weld, 900 lbs.
11 and 12 in., lap-weld, 800 lbs.

On the 8-in., 10-in. and 12-in. sizes, which have more than one weight as standard, we have shown the test pressure for the heaviest weight.

Lengths—Unless otherwise specified, standard pipe will be furnished in random lengths with threads and couplings; extra strong pipe will be furnished plain ends.

Threading—Pipe and couplings shall be threaded and tapped according to Briggs' Standard. Thread must be a good commercial thread and must not leak under the specified pressure (paragraph 5). The thread must not vary more than one and one-half turns, either way, when tested with a Pratt and Whitney Briggs' Standard Gauge. All burrs at the ends shall be removed.

Couplings—Chamfered or slightly beveled couplings will be furnished on all steam pipe, and shall be of soft puddled iron, thoroughly welded and free from all blisters, pits or other defects that would break the continuity of the thread.

Tolerance—The pipe shall not vary more than 1% either way from being perfectly round and true to the standard outside diameter, except on smaller sizes, where a variation of ¼ in. will be acceptable, and shall not vary more than 5% either way from weight as listed.

Tests—All tests shall be made at the mill.

"Youngstown Copperoid" Steel Sheets

In "Youngstown Copperoid" steel a material has been developed which resists corrosion under exposure to the atmosphere in such a surprising degree that it should receive special attention from all engineers preparing specifications for steel roofing, siding, cornice work, steel window frames, sash, metal lath, and all other work in which metal sheets are used. Exhaustive tests conducted by The American Society for Testing Materials have demonstrated the rust-resisting qualities of "Copperoid" steel to be far superior to those of ordinary steel, so-called "pure irons," made in open hearth furnaces, or, in fact, any other metal at approximately equal cost. Full information on this subject can be had on application or by reference to the reports of this test as published by the Society.

Our own tests conducted over a series of years indicate that for roofing and siding on mill buildings and other structures exposed to smoke and gases, the life of "Copperoid" steel sheets is more than twice that of ordinary steel sheets. These sheets are furnished either black

or galvanized, flat or corrugated, in all standard sizes and gauges from No. 10 to No. 30.

Identification

"Youngstown" steel pipe and "Youngstown Copperoid" steel sheets are plainly marked. In pipe, the name is rolled in the steel. On sheets, it is stenciled in the usual manner.

"Buckeye" Conduit

"Buckeye" electrical conduit is the most widely used material of this kind made in this country. It is made of



"BUCKEYE" CONDUIT

mild steel "Youngstown" pipe, carefully and thoroughly enameled or electro-galvanized. It is regularly tested and inspected by The Underwriters' Laboratories, Inc., and is used extensively on government work. "Buckeye" conduit is a product of uniform excellence entitling it to the approval of the most careful engineer.

"Realflex" Armored Cable

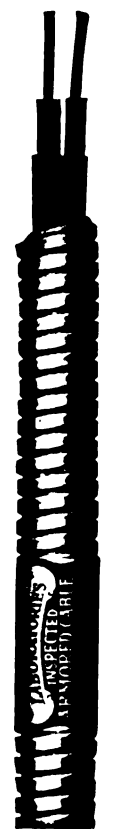
This material is now among the smallest and lightest, as well as the strongest and most flexible of all flexible steel armored electrical conductors. It has recently been greatly improved by reducing its diameter and weight. "Realflex" is armored with hot-galvanized steel wire, and gives about the same protection as rigid steel conduit. Its remarkable flexibility, great strength and permanently handsome appearance suggest its use especially for exposed wiring in industrial plants, factories and other locations where conductors are subject to unusually hard conditions. It is made in a number of sizes specially designed for transmitting current for power, and is particularly recommended for use on and about motor driven machinery because of its extreme flexibility and the thorough protection afforded by its armor. For wiring in which rigid steel conduit can not be economically used, the logical substitute is "Realflex."

Sizes and Weights

All of these products are regularly manufactured in standard sizes and weights, but they can be furnished to meet special requirements within reasonable limits. All of them can be obtained from leading jobbers and dealers in all parts of the United States, as well as in most foreign countries.

Additional Information Supplied on Request

This company is always glad to furnish detailed information concerning any of its products and to render any assistance possible to engineers who communicate with it direct or with any of its sales offices as listed herewith.



"REALFLEX"
ARMORED
CABLE

AMERICAN FOUNDRY & CONSTRUCTION CO.

Manufacturers of and Contracting Engineers for Power Piping Systems
PITTSBURGH, PA.

NEW YORK, N. Y., 469 Fifth Avenue

CHICAGO, ILL., 17 North La Salle Street

Products

Designers, manufacturers and erectors of COMPLETE PIPING SYSTEMS for Power Plants and all kinds of Industrial Plants.

Services

This company has had many years' experience in the installation of piping systems for steel mills, paper mills, chemical plants, refineries, etc., and offers the benefit of their broad experience to prospective customers.

Their engineering department will be pleased to furnish estimates on piping systems, either f. o. b. the job ready for erection, or installed complete in accordance with plans and specifications.

Facilities

The manufacturing facilities of the AMERICAN FOUNDRY & CONSTRUCTION CO. consist of a pattern shop, foundry, machine shop, pipe bending and fabricating shop and a welding shop. They control not only the delivery, but also the quality of their materials.

They have a corps of erecting engineers who are specially trained for their work, and who consequently know how to look out for even the smallest details incidental to the installation of piping equipment.

Valves

The company manufactures all kinds of valves up to 3000 lbs. pressure, made of cast iron, cast steel and semisteel, with mountings to suit the service for which they are intended.

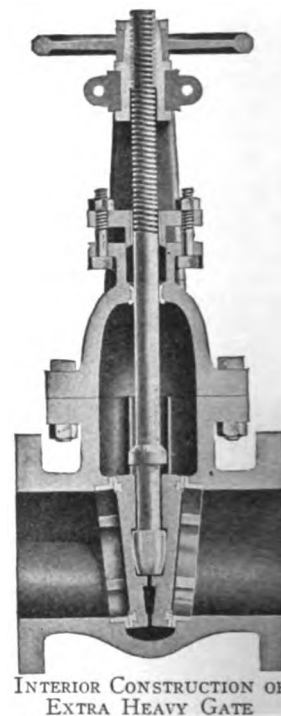
Special valves are also designed and supplied. The regular patterns include the following types: gate, globe, blow-off,

check, hydraulic, Critchlow, float, transfer, gas line and drilling; also cocks.

The extra heavy gate valves have double adjustable discs and one-piece stem. The body is of semisteel or cast steel, and stem and mountings of bronze or monel metal, as required.

Fittings

The company manufactures flanged and screwed fittings for any service or pressure, made of cast iron, cast steel or semisteel. Unless otherwise specified, these fittings are made in accordance with the manufacturer's or the A. S. M. E. standard specifications. Special fittings of any kind will be furnished on request.

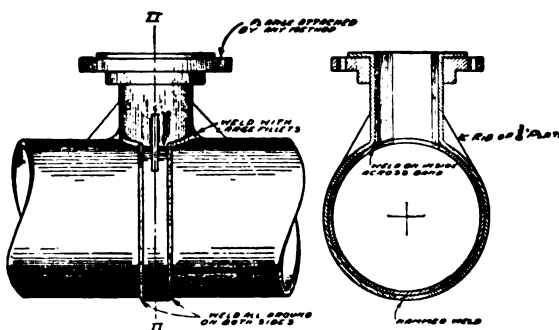


Flanges

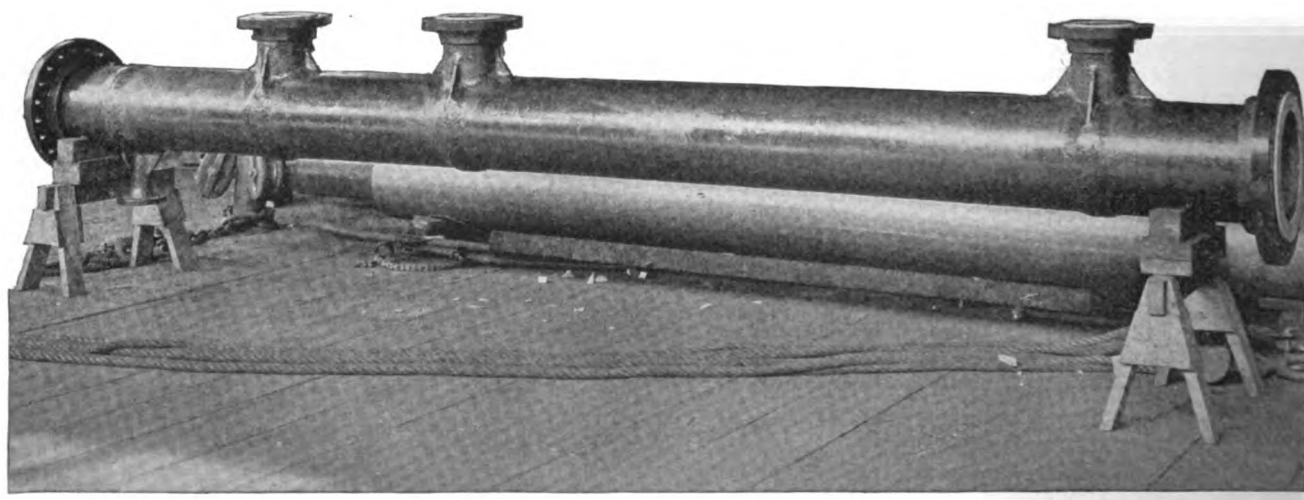
The AMERICAN FOUNDRY & CONSTRUCTION CO. manufactures cast iron, cast steel, semisteel and rolled steel flanges of any style required, either loose or attached to the pipe by any method. The Van Stone joint (illustrated on the following page) is particularly applicable for high pressures.

Pipe Bends

A complete bending shop furnishes any style bends re-



SECTIONAL DETAILS, "AMERICAN" REINFORCED WELDED NOZZLE
(Patent applied for)



"AMERICAN" REINFORCED WELDED HEADER

quired. Extra long lengths of pipe in stock for special bends (see illustration).

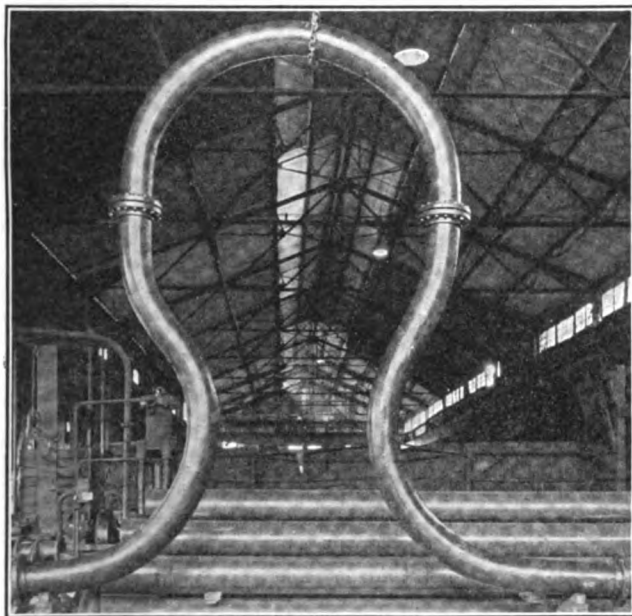
Pipe Fabrication

Pipe can be furnished cut to any length desired, and with the flanges attached by any method—screwed, Van Stoned, welded, shrunk, etc.

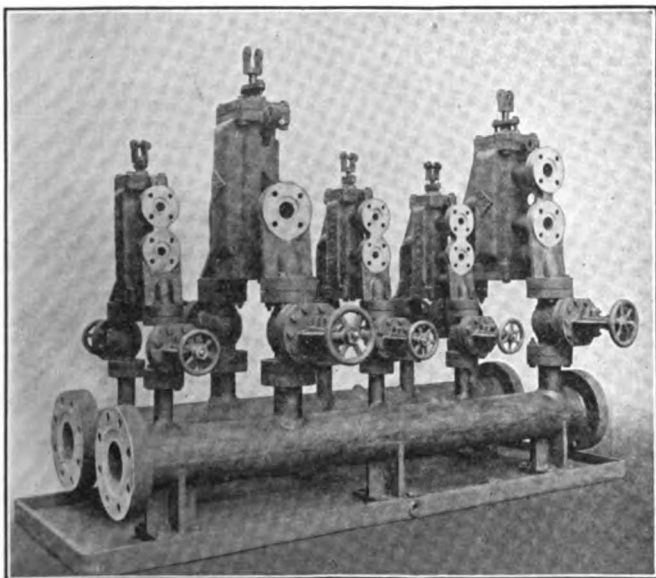
Welding

This company specializes on welded headers and special welded apparatus incidental to piping installations. Welding is done by oxy-acetylene or electric processes, depending on service for which it is to be used. All welds are thoroughly annealed and tested before shipment.

The special welded outlet for headers has reinforcing bands around the pipe, designed to give the outlet a tensile strength greater than the bursting pressure of the pipe itself.



EXPANSION BEND FOR 12-IN. STEAM MAIN

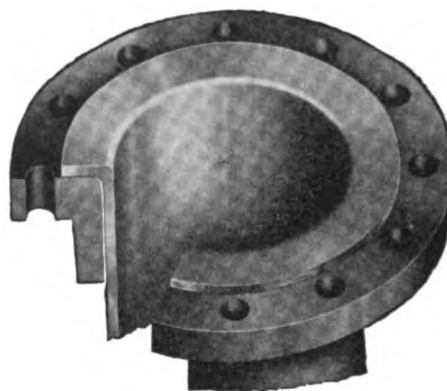


HYDRAULIC OPERATING PULPIT
750 lbs. working pressure

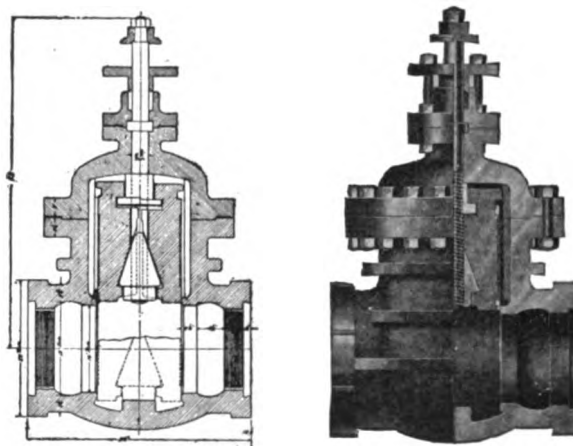
Literature

The pocket size catalogue published by the AMERICAN FOUNDRY & CONSTRUCTION Co. gives list prices and general dimensions of standard valves, fittings, flanges, etc., for any service. They also issue a supplement which shows only their gas and oil line materials, and pamphlet on welded apparatus.

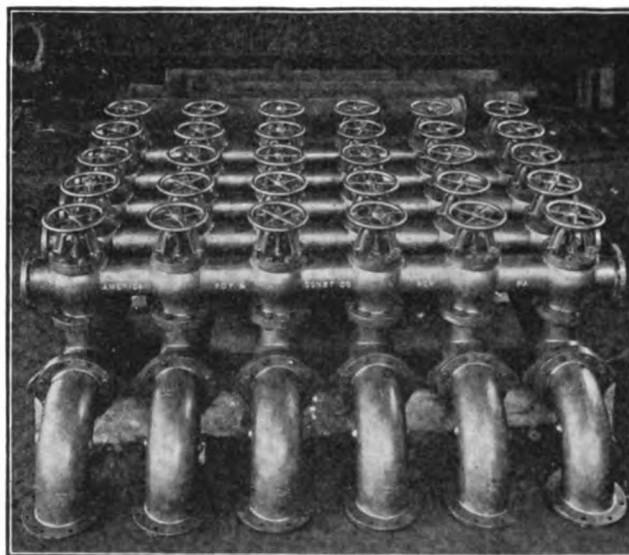
Any of the above will be mailed on request.



"AMERICAN" VAN STONE JOINT



DRILLING GATE VALVES
2500 lbs. test pressure



ALL-BRASS VALVE MANIFOLD FOR DISTRIBUTING SUGAR TO
GRANULATORS

GRINNELL COMPANY, INC.

Heating, Industrial and Power Plant Piping

EXECUTIVE OFFICES
PROVIDENCE, R. I.

For Branch Offices, see page

Products and Services

Complete CONSTRUCTION SERVICE ON POWER PLANT, HEATING and INDUSTRIAL PIPING, including Estimates and Materials, Installation, the Personal Supervision of all work, and where engineering talent is not otherwise retained, Complete Engineering Service.

CONSTANT LEVEL SIZE CIRCULATING SYSTEMS; HUMIDIFYING SYSTEMS; TRAY TYPE DRYERS; TEXTILE DRYING MACHINERY.

Also, Spray Cooling Systems; Compressed Air Cleaning Systems; Piping for Acids, Alkalis and other special materials; Fittings, Valves, etc.; Pipe Bending and Fabricating; Threading and Welding.

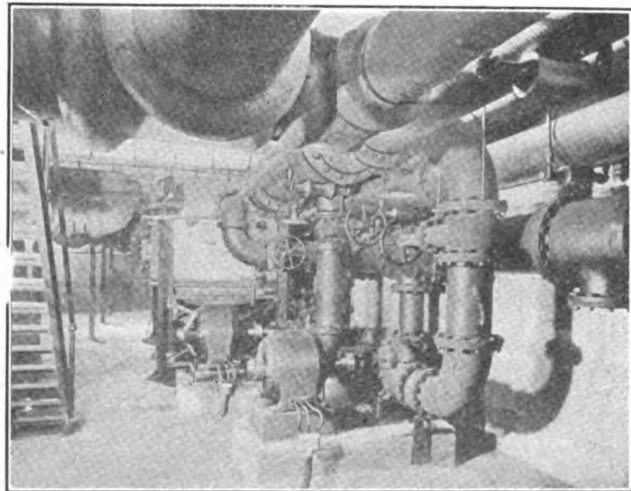
For Automatic Sprinkler Systems, see page 256.

Evils of Poorly Designed Piping

Present high costs of coal and other supplies necessary to the operation of all kinds of power and heating plants, and the present scale of wages, make efficient and economical performance absolutely necessary. Plant owners must positively stop costly waste, hitherto regarded as unavoidable, and see to it that every unit is producing its maximum capacity at minimum cost.

High grade machinery, if served by poorly designed and indifferently installed piping, does not produce the expected results. This condition is frequently brought about either by too small a pipe line, producing a great drop in pressure at the discharge end, lines with too many short turns, headers and other steam lines so large that the low velocity of flow induces excessive condensation and heat loss, or too many parallel lines serving the same or similar purposes.

Lack of Flexibility—Too frequently an otherwise good arrangement is spoiled by insufficient flexibility, resulting in overstrained joints due to expansion and contraction. This condition inevitably means great expense for maintaining pipe joints and keeping the line in good repair, and imposes a great injustice on the operative who must spend his Sundays or leisure hours doing a job which proper design would have rendered unnecessary.



WELDED HEATING MAINS AND BRANCH TEES
Experienced Grinnell men welded these lines on the job

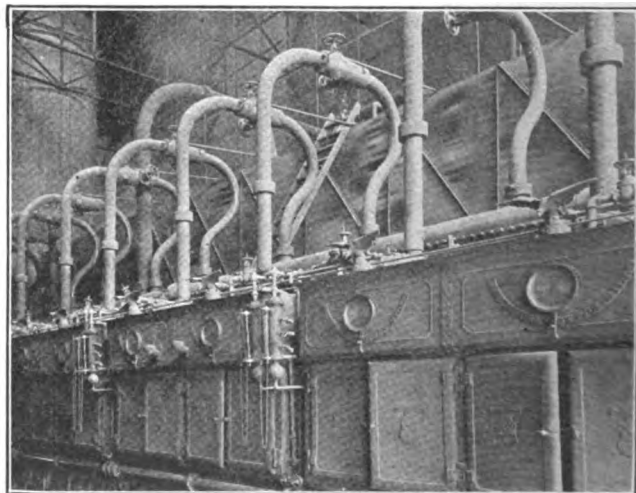
Poor Drainage—Considerable annoyance and expense is caused by piping which becomes pocketed, due to poorly selected hangers or indifferent workmanship, preventing proper drainage. Where low points in steam or exhaust piping systems are necessary, great care should be taken to provide proper means of automatically draining these points without depending on draining by hand.

Insulation—The question of the advisability of the use of insulation as a means of preventing heat loss is necessarily one to be determined by the engineers designing the piping. Great waste may be avoided by the installation of the proper type of insulating materials, applied to lines where the heat loss can not be used to good advantage for heating purposes. Too often pipe lines and other hot surfaces are not properly insulated. In many cases, however, insulation is used to correct faulty design of pipe size, whereas, if proper circulation could have been maintained by properly equalizing the pipe sizes, the bare surface of the pipe could be used as a very efficient heating surface in place of an equal or greater amount of radiation.

Improvements Effected by Grinnell Piping System

Correct Pipe Sizes—The size of pipe to be used is determined by weighing carefully the two prime factors of *first cost* and *frictional resistance*. There is obviously a correct size of pipe to be used in the case of every pipe line, and this size will be the economical size, both from the standpoint of first cost and the standpoint of frictional resistance caused. The frictional resistance means the power consumed in the transmission of the liquid or vapor.

Where proper engineering talent is retained these factors, of course, receive proper attention. In many cases, however, piping is installed without proper engineering supervision, with resultant waste and high maintenance cost. Where necessary, Grinnell is glad to supply an engineering service based on 70 years of practical experience. To consulting engineers we offer a construction service that insures proper carrying out of their plans.



PIPE BENDS FROM BOILERS TO MAIN STEAM HEADER AND
BEND FROM HEADER TO ONE PRIME MOVER
Illustrative of Grinnell pipe bending service

Long Radius Bends—Short turn screwed fittings and ordinary globe cut-out valves, used in important pipe lines in many plants, cause great loss of pressure due to the sharp turns which result. Globe valves for cut-out purposes should be displaced by straightway gate valves and long radius bends used in place of short turn elbows. These bends offer no more resistance to the flow than an equal length of straight pipe, and the distance is actually less than when straight pipe is used with elbows. Long radius bends are almost invariably employed in Grinnell piping systems where it is necessary to provide for expansion and contraction of piping. They are also used in lines where resistance is a prime factor to cut down the friction caused by ordinary fittings.

Automatic Non-return Valves—These should be used in the steam branches from boilers to the header in every installation of two or more boilers. This type offers a greater protection to the boiler and to the employee than any other form of valve.

Elimination of Overloads—Many overloaded reciprocating engines are now "wire drawing" and straining at their tasks because of long, small pipe lines. They could easily carry the load if large receiver type separators were placed on the throttles. This permits the receiver to become filled with steam at boiler pressure while the engine admission valve is closed, and provides a great volume of full pressure steam ready to enter the cylinder the instant the valve opens.

Utilization of Waste Hot Water—Incalculable loss is incurred every day by permitting hot water waste from heating systems, slashers, drying machines, dry kilns and other steam consuming machines. Both the water and the valuable heat it contains should be recovered and returned directly to the boiler.

Savings Under Grinnell Systems

The installation of modern piping systems and appliances produces an immediate saving in coal consumption. In many cases such savings have paid the entire cost of the improvements in a few years.

In connection with modernizing old systems we are always glad to make a survey and estimate the cost of such changes as may be required.

Flexibility and Simplicity of Grinnell Systems

The necessity for flexibility in power piping design can not be too strongly emphasized. The piping systems must be laid out, and the valves so arranged that the operating engineer can, at will, cut out one or more boilers, engines, or other steam-using machines, for repairs or renewals, replacing them with standby machines which, unless the piping system is properly planned, may be found useless in time of need.

While it is desirable that an adequate number of valves, etc., be provided, it is equally necessary that they be kept down to the least number commensurate with efficiency and safety. Long circuitous lines should be made as direct as practicable and proper expansion bends provided on rigid lines to allow for the absorption of expansion and contraction.

Simplicity in piping design is of the utmost importance in order to keep first cost within reasonable limits, to insure economical operation and reduce upkeep.

Grinnell Heating Systems

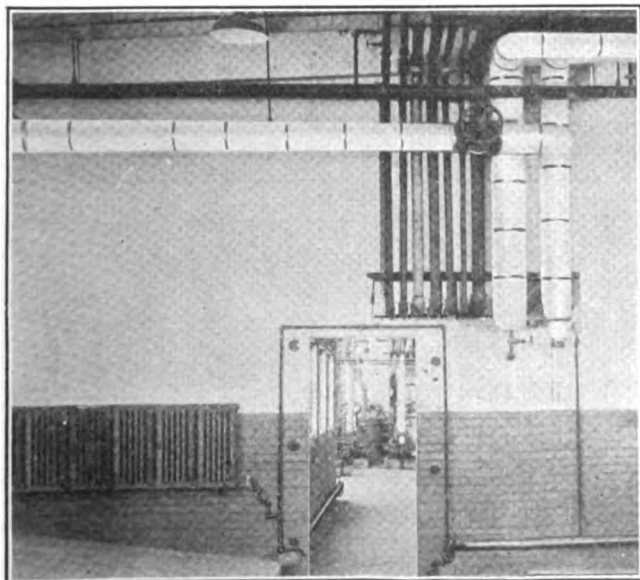
Many complaints of inefficient heating arise from improperly designed or unsuitable heating systems. The whole subject of economical heating should be approached from a purely scientific standpoint, covering not only the cubic contents of the building but also its structural details and the suitability of one or another heating system to the particular building under consideration.

It is by careful pre-consideration of all these elements that Grinnell heating engineers are able to install a system that not only produces the required degrees of heat but does so on a minimum coal consumption.

For many mills and other industrial plants the Grinnell system of semiautomatic temperature control will provide ample heat, graduated to meet internal conditions and, regardless of outdoor temperatures, at a far lower cost per unit than any other system.

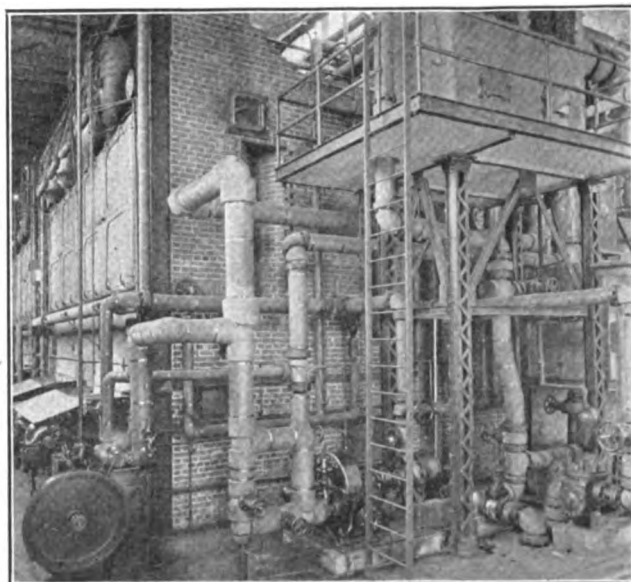
Remodeling Old Heating Plants

Heating plants often give unsatisfactory results due to radiation additions without proper increase in the capacity of the piping. Natural deterioration of the system also causes low efficiency. We are in an excellent position to remodel such plants and put them in perfect working condition.



NOTE NINE DIFFERENT PIPING SYSTEMS, HEATING COILS AND AUTOMATIC SPRINKLERS

A part of the piping installed in this automobile tire factory by Grinnell engineers



A COTTON MILL POWER PLANT—SUPERHEAT, BOILER FEED AND FEED WATER CONTROL PIPING, ALSO CONNECTIONS TO HEATER AND AUXILIARIES

Installed by Grinnell

When factory buildings are increased in length a change in the method of heating is often made necessary. A careful study and analysis of every such case will be made by an expert heating engineer. Old systems, apparently obsolete and practically worthless, may be brought up to a state of high efficiency under such skilled remodeling, thereby saving many thousands of dollars.

The highly trained corps of specialized piping engineers maintained by GRINNELL COMPANY, INC., and its experienced construction department, insure proper design as well as satisfactory installation and operation. The plant owner and his designing engineer will receive capable and ready co-operation from these experts in the development of his plant.

Steam Power Plants

GRINNELL COMPANY, INC., is prepared to handle all installation work and to co-operate fully on any engineering problem incident to complete piping systems for power plants serving textile mills, electric lighting plants, electric power plants, water works, steel rolling mills, blast furnaces, copper mines, saw mills, oil mills, pulp and paper mills, tanneries, bleacheries, dyeing plants, water filter plants, phosphate mines, fertilizer factories, or any others of similar nature.

We are prepared to furnish or fabricate in our shops all equipment and material required, erecting same in the most approved manner.

Piping for Chemical Plants and Other Special Purposes

Not only is GRINNELL COMPANY, INC., skilled in installing efficient steam or water lines for ordinary purposes, but we install all piping required in processing plants, or plants which involve the use or treatment of acids and alkalis.

We furnish pipe made of steel, cast iron, genuine wrought iron, and spiral riveted pipe, black or galvanized. We also furnish brass, copper, and aluminum pipe; pipe that is lined with various metals or alloys; and specially treated acid resisting pipes, with suitable valves and fittings for all the above classes of materials.

Gaskets, packings and specially designed joints will be provided as each specific condition requires.

Acting under the direction of the consulting engineer, chemical engineer, or some qualified attache of the

plant, GRINNELL COMPANY, INC., will cheerfully submit proposals for piping equipment for pulp and paper mills, sugar refineries, soap factories, fertilizer works, bleacheries, dyeing plants, phosphate works, cement mills, gas plants, oil refineries, cotton oil mills, etc.

Constant Level Circulating Size System for Textile Plants

This system while simple in design and operation is a great money saver in the slasher room. By keeping a constant level of prime size uniformly circulating it saves starch, gives uniform sizing, reduces the number of "seconds," allows the slasher tender to watch his yarn instead of bothering with size. A special booklet will be sent on request.

We are prepared to furnish and install complete outfits of design and material best suited to individual needs and conditions.

Grinnell Dryers

Tray Type Dryers—Grinnell tray type dryers establish a new measure of perfection in drying results, a new basis of economy in operating costs, a new standard of value in structural materials and workmanship.

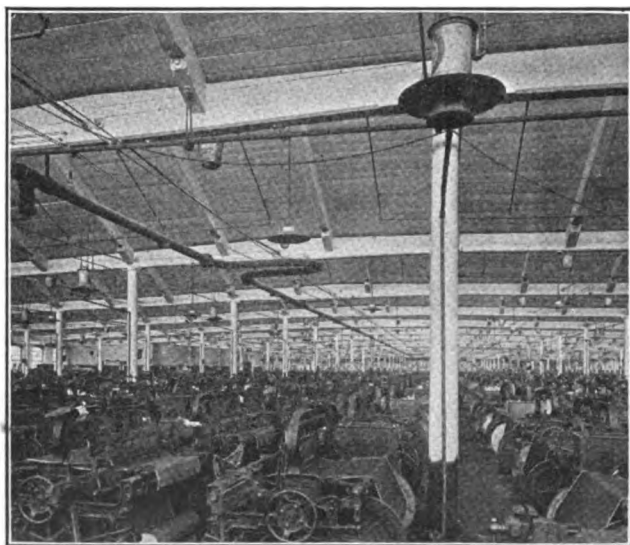
These new dryers are offered to the trade only after years of laboratory and field experience and satisfactory performance is absolutely guaranteed.

They dry uniformly over every inch of every tray and without disturbing even the finest product. These results are accomplished with the utmost economy. Air once heated is not wasted but is re-circulated through the cabinet until the saturation point is approached more nearly than is possible with any other dryer.

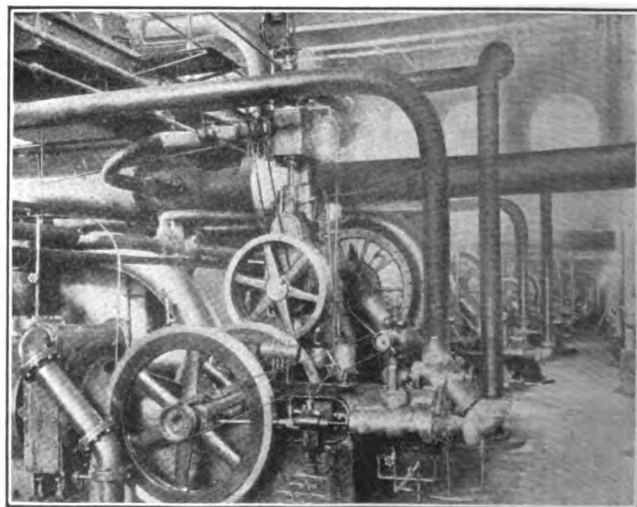
Textile Drying Machinery—In addition to its tray type dryers, Grinnell also manufactures a complete line of textile drying machinery, and through its engineering force is prepared to advise on any drying problem. The chief feature of our textile drying machinery is its more rugged construction and its double insulation.

Humidifying Systems

Through our affiliations with American Moistening Company, we are in a position to design and install complete humidifying systems, using devices long standard in this work. An especially reliable and sensitive control is a feature of all American Moistening Company equipments, which include sectional, fan type, high duty, and ventilating humidifiers; atomizer or compressed air systems; air conditioning room equipment, etc.



COMPLETE PIPING SERVICE BY GRINNELL IN WORLD'S LARGEST
WEAVE ROOM—HEATING SYSTEM, AUTOMATIC SPRINKLERS,
HUMIDIFIERS



STEAM SUPPLY AND EXHAUST PIPING FOR 10,000 Kw. TURBINE
AND AUXILIARIES IN A MUNICIPAL POWER STATION
A representative Grinnell power piping job

PITTSBURGH PIPING AND EQUIPMENT CO.

Manufacturers of and Contractors for Fabricated Piping Systems

GENERAL OFFICE AND WORKS

PITTSBURGH, PA.

BRANCH OFFICES

NEW YORK, N. Y., 220, Broadway
CLEVELAND, OHIO, American Trust Building
BIRMINGHAM, ALA., American Trust Building

CHICAGO, ILL., Peoples Gas Building
INDIANAPOLIS, IND., Traction Terminal Building
SAN FRANCISCO, CAL., Monadnock Building

Products and Services

PIPING and FITTINGS, including Valves; Flanged Fittings and Flanges; Special Cast Iron and Cast Steel Flanged Fittings; Pipe Bends and Fabricated Piping; Van Stone and Sargol-weld Pipe Joints, Slip and Copper Expansion Joints; Welded Headers; Steam Separators; Piping Systems complete, ready for installation, or delivered and erected.

Complete PIPING EQUIPMENTS are furnished and installed in power plants of all kinds, including electric light, street railway, blast furnaces, steel works, and industrial plants of any and every description. The pipe is fabricated in this company's shops and erected with its skilled labor. Complete piping installations are furnished ready for erection, if the owners prefer to install same. Any make of valve, separator, trap or any steam or water specialty that may be desired, can be supplied.

Piping Equipment

The installation of piping equipment is made a specialty. The officers of the company give personal attention to the supervision of contract work. Experts are in charge of every contract, which insures correct installations and satisfactory service.

Pipe Bends

Modern practice demands that pipe bends should be used when possible. They prevent leakage by allowing for expansion and contraction, reduce friction and loss of pressure. The cost is no more than that of the fittings displaced by their use. Table of standard bends on request.

Sargol-weld Joint

For high pressure superheated steam lines the Sargol-weld joint, eliminating the use of gaskets, is the last word.

Write for particulars.

Welded Headers

Wrought steel headers with welded-in nozzles for modern requirements of high pressures and temperatures. These headers are used where lightness and strength are desired. All wrought steel headers are made with Van Stone flanges.

Construction

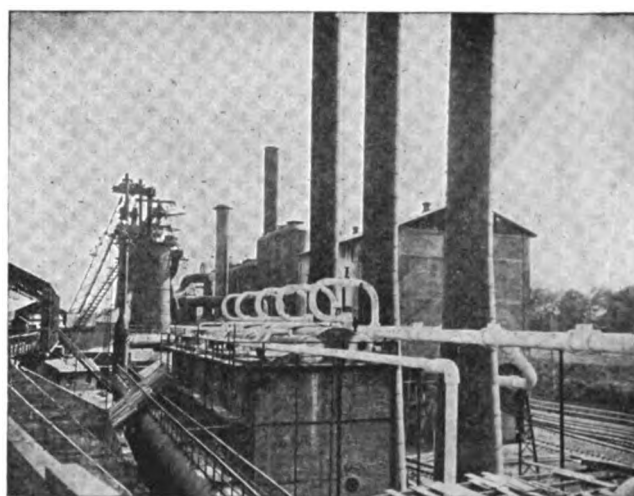
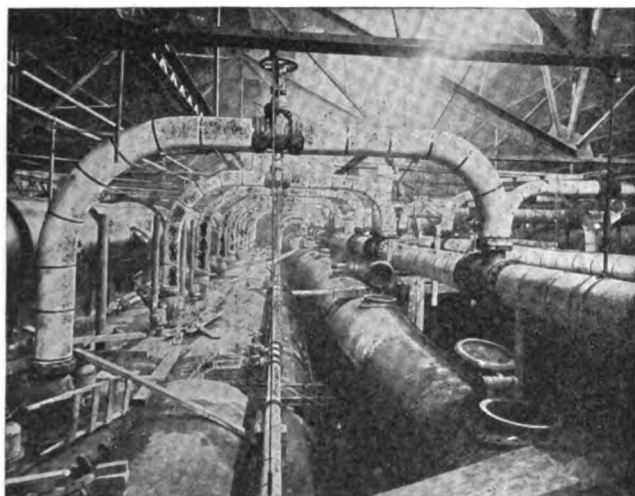
The material manufactured and fabricated is prepared in this company's shops by skilled labor with special machinery and appliances. It is designed for the service required, so that whether it is to be used for hydraulic pressures, superheated steam or exhaust steam, it is made of proper material and sufficient strength to make it absolutely safe.

The machinshop, bending, forging and welding departments, lack nothing in equipment for handling the most intricate detail that enters into power plant piping construction.

Iron and steel foundries are equipped with the most modern tools and appliances, and with its skilled workmen, the PITTSBURGH PIPING AND EQUIPMENT CO. is able to produce the best there is in cast piping equipment.

Contracts for Piping Installation

This company is prepared to contract for piping installations at any place in the United States and Canada and for any service, including the highest pressure of superheated steam and hydraulic working pressures up to 5000 lbs.



INSTALLATIONS OF PIPING WHERE STEAM PRESSURE LOSSES BY FRICTION ARE REDUCED TO A MINIMUM

POWER PIPING COMPANY

Industrial Piping Engineers

GENERAL OFFICE AND WORKS

829 Beaver Avenue
PITTSBURGH, PA.

BRANCH OFFICES

CLEVELAND, OHIO, 30 Euclid Arcade Annex
CHICAGO, ILL., 1107 Peoples Life Building

NEW YORK, N. Y., 50 Church Street
WASHINGTON, D. C., 210 Albee Building

Products

PIPING SYSTEMS complete in every detail, including design, construction and erection, for every industrial purpose.

ACETYLENE and ELECTRIC WELDING in all its branches.

Also Van Stone Joints with square corners, Welded Nozzles and Steam Headers

Facilities and Service

The requirements of the present day for piping systems are extensive and vitally important to economical operations on large scale industrial production.

We feel that the examples of our work shown in these pages will enable prospective buyers to see that our organization is equipped in every way to build piping systems no matter how large or how complicated.

Both for complete installations and for individual jobs of welding, coiling, flanging and bending, we offer an exceptionally adequate service. We are frequently

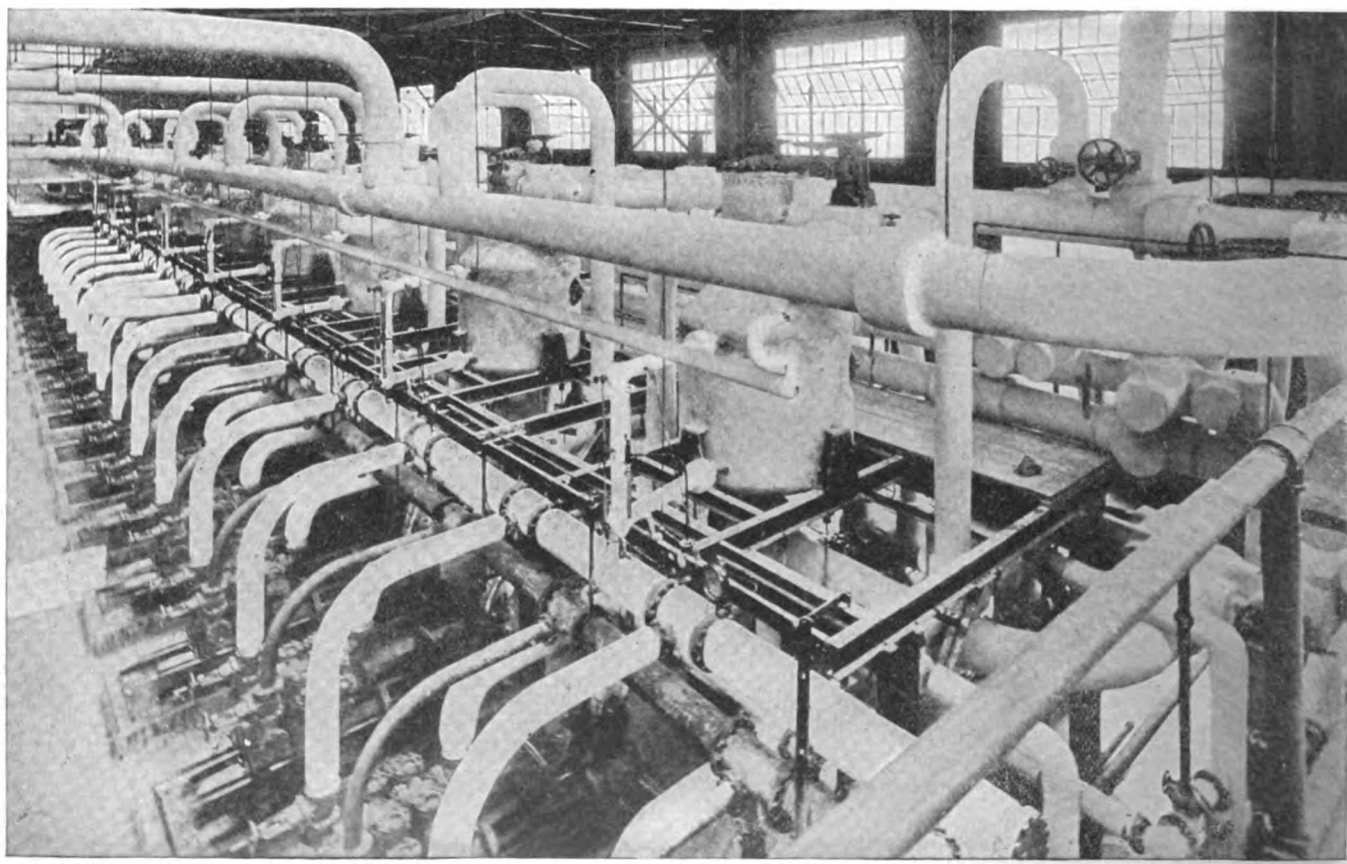
able to overcome unusual difficulties by original departures from common practice.

Complete Pipe Systems

The many different angles of pipe bends and large pipe diameters, shown below, clearly indicate our facilities for handling the most complicated piping systems.



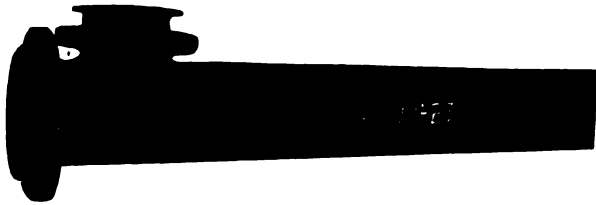
WELDED RETURN BEND



HIGH PRESSURE PIPING INSTALLATION

Welded Equipment

Piping systems, whether for steam, water or gases, should be given the greatest possible consideration in design. Welded nozzles eliminating fittings and joints are more economical both in first cost and maintenance. All welded nozzles are annealed after attachment and tested to three times the working pressure.



EXAMPLE OF WELDED PIPE CONNECTION

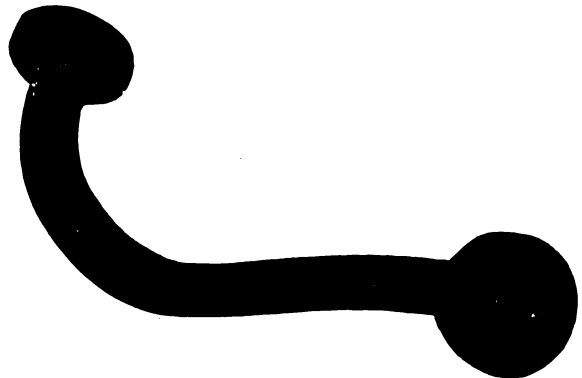


WELDED HEADER ENTIRELY FROM PIPE

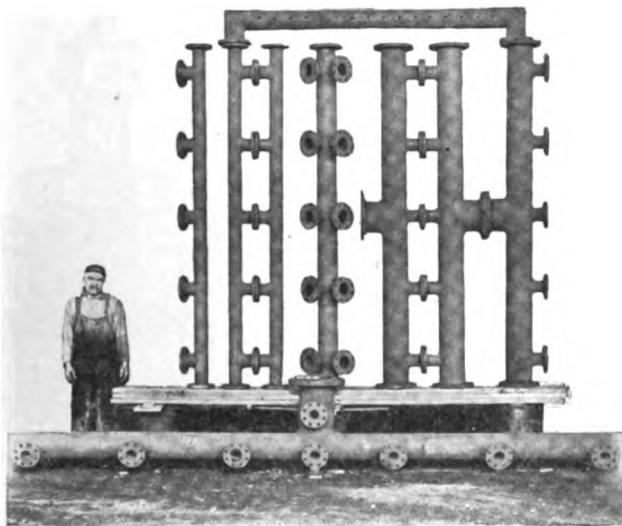
Hydraulic Piping

We design and build in our own shops hydraulic power piping, for industrial operations in metallurgical plants, rubber factories, cottonseed and other vegetable oil plants, petroleum refineries, soap works, etc.

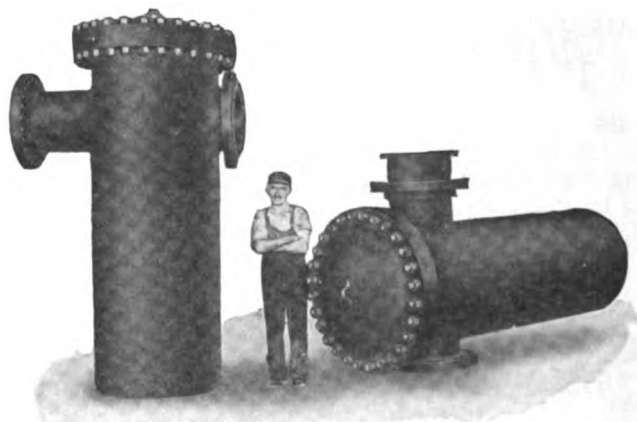
All hydraulic piping, flanges and fittings are tested by us before shipment.



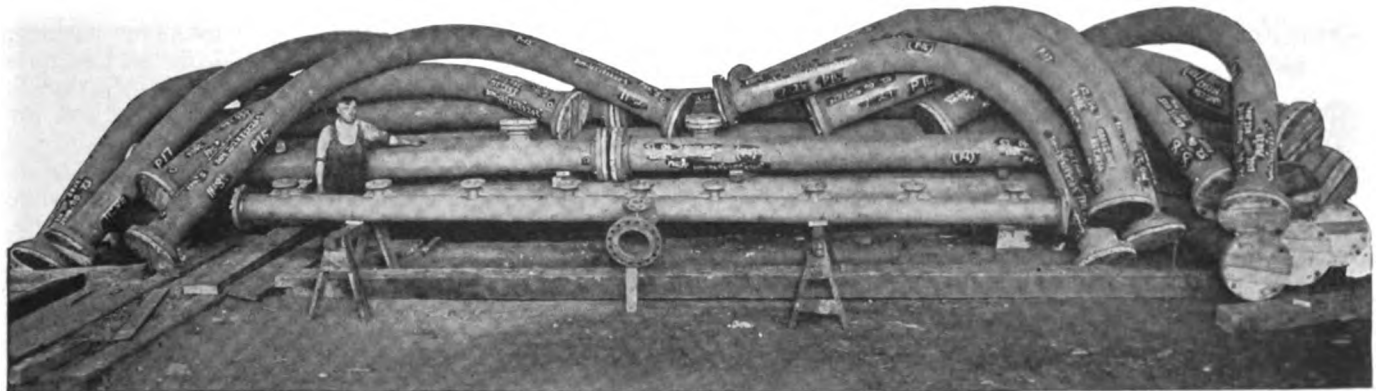
PIPE TESTED TO 10,000 LBS. PER SQ. IN. FOR HYDRAULIC WORK



WELDED PIPE CONNECTIONS FOR OIL REFINERY



WELDED 18-IN. HIGH PRESSURE STEAM RECEIVER SEPARATOR



HIGH PRESSURE STEAM PIPING FOR EXPORT

JOHN SIMMONS CO.

Piping, Mill and Factory Supplies

GENERAL OFFICES

102-110 Centre Street

NEW YORK, N. Y.

Products

PIPE: Distributors of "National" Steel and "Byers" Genuine Wrought Iron Pipe; Cast Iron Flanged; Cast Iron Water; Cast Iron Soil; Brass and Copper.

FITTINGS: Distributors of Jarecki Fittings; Cast Iron, Malleable Iron, Steel and Brass, for steam, water, gas, air and ammonia; Standard, Medium, Extra Heavy and Hydraulic; Simmons Unions.

VALVES: Distributors of Jarecki Valves; Iron, Steel, Brass, Gate, Globe, Angle and Check; Standard, Medium and Extra Heavy, for steam, water, gas, air and ammonia; Blow-off, Elevator, Radiator, Regulating, Relief, Tank and Vacuum; Foot Valves.

Distributors of Wm. Powell Co. line of Valves, Lubricators, etc., in New York territory.

Also Sectional Concrete Pile Casing; Steam Traps; Automatic Gravity Scales; Pressure Tanks; Steam, Hand and Power Pumps; Scranton Pumps; Injectors; Pipe Machines; Vises, Stocks and Dies, Wrenches, Drills, etc.; Expansion, Oil and Storage Tanks; Brass, Lead and Iron Traps; Red Seal Metallic Packing or Gaskets; Pipe Joint Compounds.

For Plumbing Supplies, see page 264.

Pipe

A large stock of genuine wrought iron, cast iron and steel pipe, also soil, brass and copper pipe carried on hand for immediate delivery.



"NATIONAL" STEEL AND "BYERS" GENUINE WROUGHT IRON PIPE, BLACK AND GALVANIZED

Drop Forged Steel Fittings and Valves



DROP FORGED STEEL FITTINGS

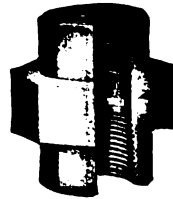
The "Simmons" line of drop forged steel fittings has been put on the market in answer to the increased demand for fittings free from flaws or airholes liable to be found in all cast fittings, whether gray iron, malleable or cast steel. Fittings are bored out of solid forgings.

Prices quoted on fittings for all pressures up to 10,000 lbs. per sq. in. Drop forged steel valves for pressures up to 5000 lbs.

In inquiring for prices please state conditions, and quantity.

Simmons Unions

Malleable iron with bronze seat. For 250 lbs. steam working pressure.



SIMMONS UNION

We know of no union, regardless of weight, that will, in actual use or in test, stand greater pressure or greater strain. The joints are ball shape and ground to fit, insuring a perfect contact of the entire surface and eliminating the use of gaskets or lead. Every union is matched and tested before leaving the factory. Write for prices.

Wm. Powell Co. Valves and Accessories

"White Star" Brass Globe Valve—With regrindable, reversible, renewable disc.

Material—The body is cast of a mixture conforming to the formula for valves required by the Bureau of Steam Engineering, Navy Department.

Disc—The discs are regrindable, reversible and renewable. When one face of the disc is worn out, reverse it; when both faces are worn out, buy the disc alone without having to buy a new valve.

Regrinding—The disc can be reground to a bearing without the use of a regrinding machine. The guides in the body neck always keep the disc in a vertical position, no chance for an uneven seat when regrinding.

Beveled Joints—The patent beveled ground joint connection between bonnet and body neck secured by a hexagonal union swivel nut insures an absolutely steam-tight joint under all pressures.

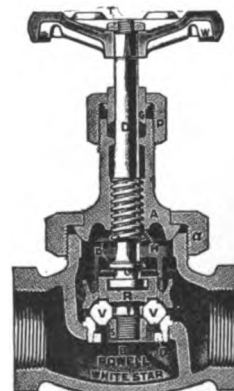
Stems—The stems are packed with a drive gland in stuffing box with plenty of room for packing. Cast of special metal and machined with an Acme thread, which is admittedly the best for severe use.

White Wheels—Non-heating iron hand wheel enameled white with projecting knobs allow a firm, cool grip even though the hands may be oily. The locknut keeps it rigidly in place.

Literature—Catalogue and descriptive circulars of the complete Powell line sent on request.



POWELL "WHITE STAR" BRASS GLOBE VALVE



SECTIONAL VIEW
POWELL "WHITE STAR"
BRASS GLOBE VALVE

SIMMONS PIPE BENDING WORKS

40 Mechanic Street
NEWARK, N. J.

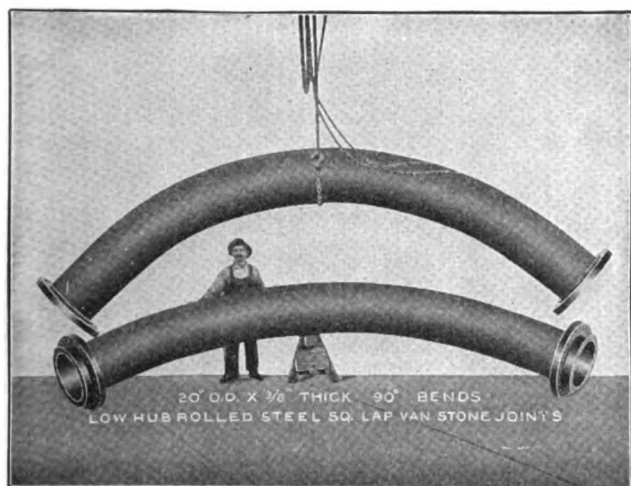
FACTORY, Avenue D and Murray Street, NEWARK, N. J.

Products

PIPE BENDS.
PIPE COILS.
WELDED HEADERS.
CAST IRON FITTINGS.
VAN STONE JOINTS.
VALVES.
STEAM SPECIALTIES.

Pipe Bends

Made in all shapes and sizes from $\frac{1}{8}$ to 30 in. Full card weight or extra heavy pipe manufactured for the purpose used. Furnished with screwed or Van Stone flanges in cast iron and rolled steel both standard and extra heavy.

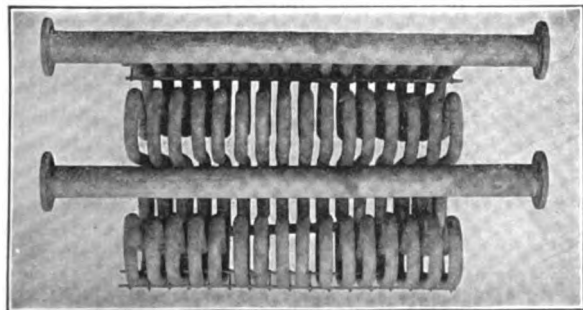


PIPE BENDS

Coils

Continuous welded construction spiral, basket, zig zag, taper, miter wall and box return bend coils made to specifications in black or galvanized from iron or steel pipe.

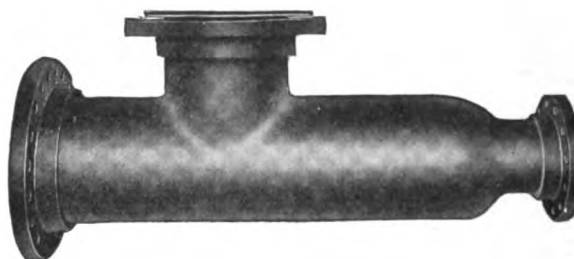
Also made from seamless steel tubing, brass or copper pipe.



PIPE COIL

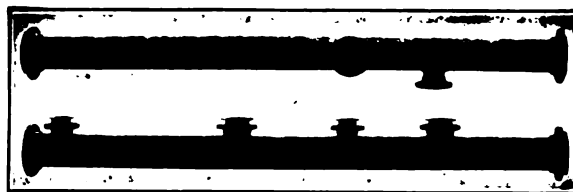
Welded Headers

Made with any number of welded nozzles in lengths limited only by means of transportation. Light unit



WELDED HEADER WITH SWAGED END

construction eliminates leaky joints and lowers shipping and erection costs. Furnished with screwed or Van Stone flanges.



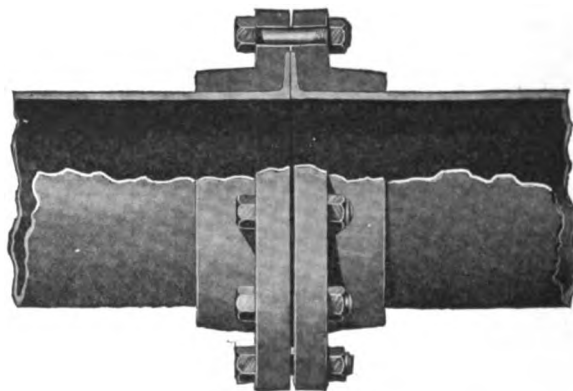
WROUGHT STEEL WELDED HEADERS

Cast Iron Fittings

Complete line of standard and extra heavy cast iron flanged or screwed fittings. Special fittings made to specifications.

Simmons Square Lap Van Stone Joints

Produced by improved machinery in sizes from 4 to 30 in. with high hub cast iron or rolled steel flanges in standard or extra heavy.



SIMMONS SQUARE LAP VAN STONE JOINT

Valves and Steam Specialties

All standard makes furnished ready for installation.

STEERE ENGINEERING COMPANY

Gas Engineers and Manufacturers of Gas Plant Equipment

MAIN OFFICE

Suite 3-162 General Motors Building
DETROIT, MICH.

Products

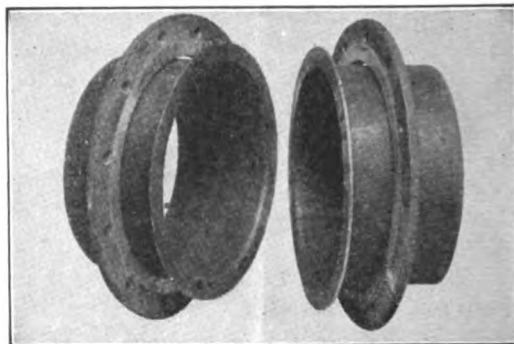
FABRICATED STEEL PIPE; STANDARD and SPECIAL WELDED STEEL FITTINGS; WELDED HEADERS and MANIFOLDS.

Also manufacturers of All Iron Gate Valves; Blast Gates; Cooling Coils; together with equipment used in the manufacture of Artificial Gas, including the Cooling and Condensing equipment, Tar and Ammonia Recovery apparatus, Multiple Washers, Purifiers, and a complete line of Gas Controls and Regulators.

Advantages of Steere Fabricated Steel Pipe

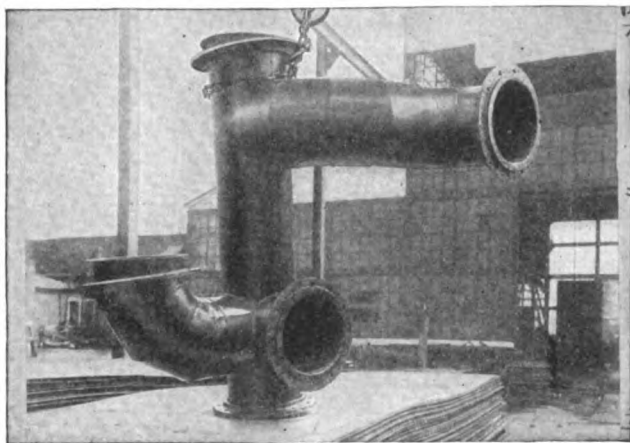
A saving of from 20% to 70% in field erection expense. A saving in field supports. Where pipe is to be covered, a saving in pipe covering by the elimina-

On pipe from 6 to 36 in. in diameter, all flanges



STEERE-ROCKWOOD JOINT

are machine rolled with smooth faces in the correct plane. Steel rings only are used; cast iron rings, in our



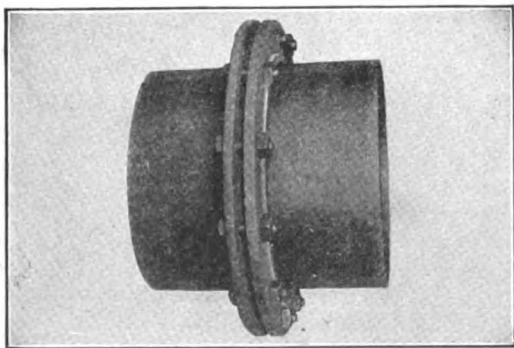
PIPE COMBINATION

tion of joints. This is a big item in steam work. A big saving in the time required to complete the work. The job will look mechanically right and will stay right.

Steere-Rockwood Joint

The joint is the vital part of any piping system. If the joints are not dependable, the rest does not amount to much.

The Steere-Rockwood joint is a modification of the original high pressure steam joint invented by George I.

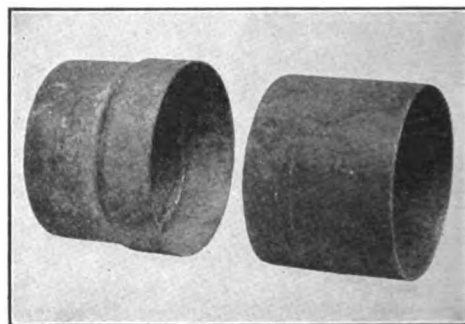


STEERE-ROCKWOOD JOINT ASSEMBLED

Rockwood. Although this joint was patented in 1897, it is still unsurpassed as a guarantee against joint trouble.

The Steere-Rockwood joint makes available for medium and low pressure service all the advantages of the original high pressure design.

SWEET'S CATALOGUE

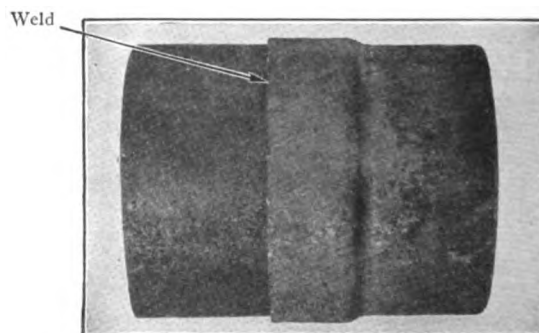


SLEEVE JOINT

opinion, are not suitable for this service and in the end are more expensive.

Sleeve Joint

For continuous welded main, this sleeve joint will save much field expense in handling, aligning and actual



SLEEVE JOINT WELDED

welding time over a simple butt joint. *It is stronger and safer than a butt joint.*

Service

Our completely equipped machine and plate shops enable us to handle expeditiously medium and heavy machine work as well as welded and riveted steel plate work of every description at a minimum of cost.

THE CHAPMAN VALVE MANUFACTURING CO.

GENERAL OFFICE AND WORKS
INDIAN ORCHARD, MASS.

CABLE ADDRESS
"VALVE, INDIAN ORCHARD"

BRANCH OFFICES

NEW YORK, N. Y.
CHICAGO, ILL.
CLEVELAND, OHIO

TULSA, OKLA.
BOSTON, MASS.
SAN FRANCISCO, CAL.

DETROIT, MICH.
SYRACUSE, N. Y.
PHILADELPHIA, PA.

LOS ANGELES, CAL.
PITTSBURGH, PA.
HOUSTON, TEX.

REPRESENTATIVES

ATLANTA, GA., W. J. NEVILLE, Chandler Building

BEAUMONT, TEX., E. L. WILSON HARDWARE COMPANY

ST. LOUIS, MO., MIDWEST PIPING & SUPPLY CO.

Products

CHAPMAN SOLID WEDGE GATE VALVES; DOUBLE and SINGLE GATE VALVES; CHECK VALVES; DRIP VALVES.



MECHANISMS for OPERATING VALVES by Hand, by Floor Stand, by Hydraulic Lift, by Electric Motor, by Pneumatic Motor and by Pneumatic Cylinder.

Also manufacturers of Hydraulic Valves, Blow-off Valves, Fire Hydrants.

For Sluice Gates, Shear Gates, Tide Flap Valves, Plug Valves, etc., see page 441.

Chapman Valves are Designed for a Wide Variety of Applications

Made for a variety of services, including low and high pressure steam, water, gas, oil, ammonia, filtration, sewage, fire protection, hydraulic operations, oil refineries, etc., and listed in the following pages according to types and pressures.

The Right Valve for Each Particular Service

Some general recommendations as to the use of Chapman valves are given below for the convenience of engineers and purchasers when specifying or selecting valves for various purposes:

CHAPMAN BRONZE VALVES

Pressure	Service	List No.
Low	Water or Steam	1 and 4
Medium	Water or Steam	4
High	Water or Steam	11

CHAPMAN IRON BODY VALVES

Low	Water or Steam	(2 to 10 in., solid wedge) 24
		(2 to 10 in., double wedge) 59½
		(10 to 84 in.) 58½
Medium	Water or Steam	42
High	Water or Steam	42½ and 43

CHAPMAN STEEL GATE VALVES

High	Superheated Steam	63½ and 65½
------	-------------------	-------------

Facilities and Quality

This company is the oldest and largest manufacturer of solid wedge gate valves in the United States. The shops are thoroughly equipped with up-to-date machines for rapidly turning out complete and accurately finished products.

Chapman valves and other products are recognized as standard for excellence of design, material and workmanship, and are not excelled in quality, finish or durability.

List 1, Bronze Gate Valves

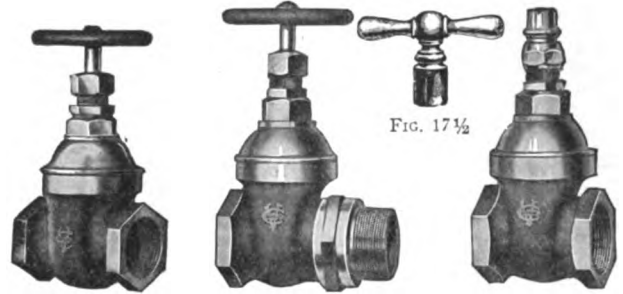


FIG. 1A. Screw End FIG. 2A. Union End FIG. 3A. Screw End, Lock Shield

BRONZE GATE VALVES

125 lbs. working pressure, 300 lbs. test

Size, in.	¼	¾	½	¾	1	1½	1½	2	2½	3
Fig. 1A, Fig. 3A, end to end, in.	1½	2	2½	2½	2½	3½	3½	4	4½	5
Fig. 2A, end to end, including nipple, in.			3½	3½	4½	4½	5½	5½		

List 4, Bronze Gate Valves

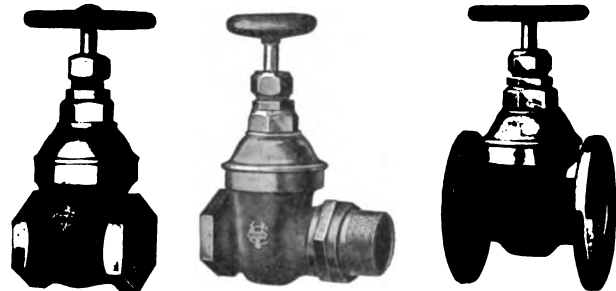


FIG. 1

FIG. 2

FIG. 3

BRONZE GATE VALVES

¼ to 2½ in., 175 lbs. working pressure, 350 lbs. test
3 to 4 in., 150 lbs. working pressure, 300 lbs. test

Size, in.	¼	¾	½	¾	1	1½	1½	2	2½	3	3½	4
Fig. 1, end to end, in.	1½	2½	2½	2½	2½	3½	4½	4½	5½	6½	8½	8½
Fig. 3, face to face, in.	2½	2½	2½	3	3½	3½	4½	5½	5½	7	8½	8½
Fig. 3, flange diam., in.	2½	2½	3	3½	4	4½	5	6	7	7½	8½	9

BRONZE GATE VALVES, FIGS. 6 AND 7

Size, in.	Fig. 6, end to end, in.	Fig. 7, end to end, in.
¼	1½	2½
¾	2½	2½
½	2½	2½
¾	2½	3
1	3½	3½
1½	3½	3½
1½	4½	4½
2	4½	5½
2½	5½	5½

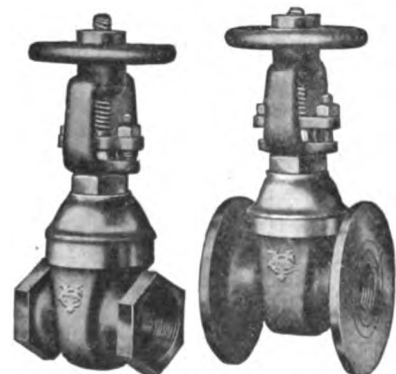


FIG. 6

FIG. 7

BRONZE GATE VALVES
175 lbs. working pressure, 350 lbs. test

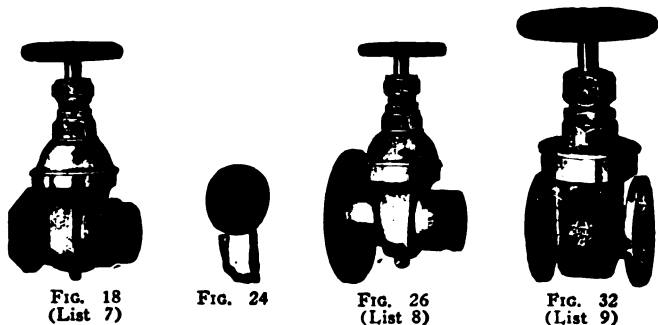
List 7 and 8, Bronze Hose Gate Valves; List 9, Drip ValveFIG. 18
(List 7)

FIG. 24

FIG. 26
(List 8)FIG. 32
(List 9)**BRONZE HOSE GATE VALVES**

Fig. 18, solid bronze seats, 150 lbs. working pressure, 300 lbs. test. Fig. 26, with babbitt seats, 175 lbs. working pressure, 350 lbs. test

BRONZE AUTOMATIC DRIP VALVE
150 lbs. working pressure, 300 lbs. test

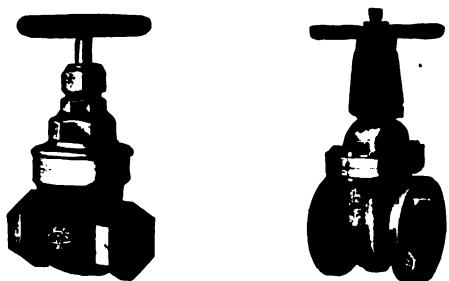
List 11, Extra Heavy Bronze Gate Valves

FIG. 33

FIG. 40

EXTRA HEAVY BRONZE GATE VALVES

Figs. 34, 35, and 36 similar to Fig. 33 but with flange ends, rising spindle, and rising spindle flange ends, respectively
300 lbs. working pressure, 600 lbs. test

Size, in.....	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2
Fig. 33, Fig. 35, end to end, in.	2 3/4	2 3/4	2 11/16	3 3/8	4	4 5/8	5 1/8	6	6 3/4
Fig. 34, Fig. 36, face to face, in.	2 3/4	2 3/4	2 11/16	4	4 3/4	5 3/8	5 7/8	6 3/4	7 1/4

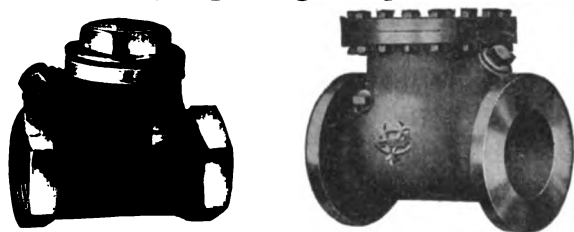
List 20 and 21, Regrinding Swing Check Valves

FIG. 64, FIG. 66B

FIG. 68B

Fig. 65 similar with flange ends
Fig. 67B similar with screw ends

REGRINDING SWING BRONZE CHECK VALVES WITH ROTATING DISK

Fig. 64, Fig. 65 (List 20), 150 lbs. working pressure, 350 lbs. test
Fig. 67B, Fig. 68B (List 21), 250 lbs. working pressure, 600 lbs. test
Fig. 66B (List 21), 400 lbs. working pressure, 800 lbs. test

Chapman regrinding swing check valves are straightway and have area fully equal to that of connecting pipes. All parts machined to jigs and interchangeable, facilitating repairs. Valve can be reground by removing angle plug and cap. A grinding mixture of oil and emery should be applied to seat. Disk can then be revolved on seat until a perfect bearing is formed. Grinding material should then be wiped away to prevent further cutting.

List 20

Size, in.....	1/4	3/8	1/2	3/4	1
Fig. 64, end to end, in.	2 1/4	2 1/4	2 1/4	3	3 3/4
Fig. 65, face to face, in.	2 1/4	2 1/4	2 1/4	3	4 1/4
Fig. 65, flange diam., in.					4

Size, in.....	1 1/4	1 1/2	2	2 1/2	3
Fig. 64, end to end, in.	3 3/4	4 1/4	5 1/4	6 1/4	7 1/2
Fig. 65, face to face, in.	5 1/4	5 3/4	6 3/4	8 1/4	9
Fig. 65, flange diam., in.	4 1/2	5	6	7	7 1/2

List 21, REGRINDING SWING CHECK VALVES

Size, in.....	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3
Fig. 66B, end to end, in.	2 3/4	2 3/4	2 3/4	3 3/4	3 3/4	4 1/4	4 1/2	5 1/2	6 1/2	7 1/4

Size, in.....	2	2 1/2	3	3 1/2	4
Fig. 67B, end to end, in.	6 1/2	9 1/2	10 1/4	11	12 3/4
Fig. 68B, face to face, in.	8 1/4	9 1/2	10 1/2	11 1/2	12 1/2
Fig. 68B, flange diam., in.	6 1/2	7 1/2	8 1/2	9	10

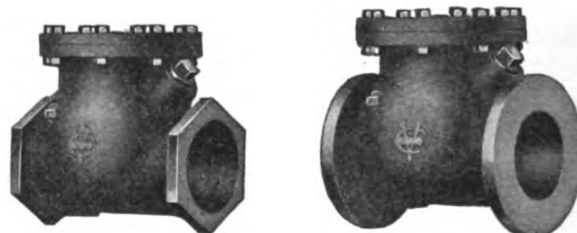
List 22, Single Disk Check Valve

FIG. 69

FIG. 69A

IRON BODY BRASS MOUNTED SINGLE DISK CHECK VALVES
150 lbs. working pressure, 300 lbs. test. Similar in appearance to Fig. 68B

Size, in.....	2	2 1/2	3	3 1/2	4	5	6	7
Fig. 69, end to end, in.	6 1/2	9 1/2	10 1/4	11	12 3/4	13 3/4	15 1/2	17
Fig. 69A, face to face, in.	8 1/4	9 1/2	10 1/2	11 1/2	12 1/2	13 1/2	15	16 1/2
Fig. 69A, flange diam., in.	6	7	7 1/2	8 1/2	9	10	11	12 1/2

Size, in.....	8	10	12	14	16	18	20	24
Fig. 69, end to end, in.	20	21	24 1/2	25 1/2	28	30	33	38
Fig. 69A, face to face, in.	18 1/2	21 1/4	25 1/4	28	30	33	32 1/2	38
Fig. 69A, flange diam., in.	13 1/2	16	19	21	23 1/2	25	27 1/2	32

We also manufacture multiple disk check valves in sizes from 20 to 72 in.

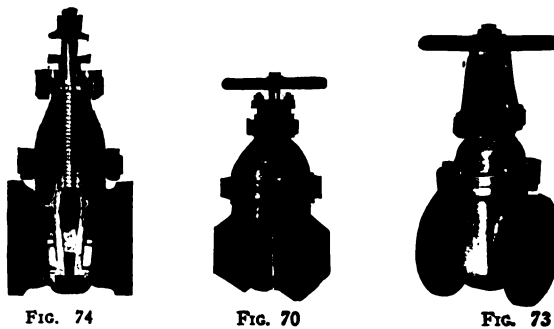
List 24, Iron Body Gate Valves

FIG. 74

FIG. 70

FIG. 73

Fig. 71 similar to Fig. 70 but with flange ends.
Fig. 72 similar to Fig. 73 but with screw ends.

IRON BODY BRONZE MOUNTED SOLID WEDGE GATE VALVES FOR WATER

Made in sizes from 2 to 48 in.

Sizes 2 to 16 in.—150 lbs. working pressure, 300 lbs. test
Sizes 18 to 30 in.—100 lbs. working pressure, 250 lbs. test
Sizes above 30 in.—80 lbs. working pressure, 200 lbs. test

Size, in.....	2	2 1/2	3	3 1/2	4	4 1/2	5
Fig. 70, Fig. 72, end to end, in.	5 3/4	6 3/4	6 3/4	6 3/4	7 1/2	8	8 1/2
Fig. 71, Fig. 73, face to face, in.	5 3/4	7 1/2	8 1/2	8 1/2	9 1/2	9 1/2	9 3/4
Fig. 71, Fig. 73, flange diam., in.	6	7	7 1/2	8 1/2	9	9 1/2	10

Size, in.....	6	7	8	9	10	12
Fig. 70, Fig. 72, end to end, in.	9	9 1/2	10 1/4	10 3/4	11 1/2	12 3/4
Fig. 71, Fig. 73, face to face, in.	10 1/4	10 3/4	10 3/4	11 1/2	12 1/2	12 1/2
Fig. 71, Fig. 73, flange diam., in.	11	12 1/2	13 1/2	15	16	19

Size, in.....	14	15	16	18	20	22	24
Fig. 71, Fig. 73, face to face, in.	14	15 1/2	16 1/2	18	21	22	24
Fig. 71, Fig. 73, flange diam., in.	21	22 1/2	23 1/2	25	27 1/2	29 1/2	32

List 42, Medium Pressure, Iron Body Gate Valves

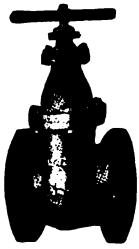


FIG. 165A



FIG. 167A

MEDIUM HEAVY IRON BODY BRONZE MOUNTED GATE VALVES FOR STEAM AND WATER

Fig. 164A similar to Fig. 165A but with screw ends. Fig. 166A similar to 167A but with screw ends
200 lbs. working pressure

Size, in.	2½	3	3½	4	4½	5
Fig. 164A, Fig. 166A, end to end, in.	6½	6¾	6¾	7½	8	8½
Fig. 165A, Fig. 167A, face to face, in.	8	9½	10	10½	11	11½
Fig. 165A, Fig. 167A, flange diam., in.	7¼	8¼	9	10	10½	11

Size, in.	6	7	8	9	10	12
Fig. 164A, Fig. 166A, end to end, in.	9	9½	10	10¾	11½	12¾
Fig. 165A, Fig. 167A, face to face, in.	12	12½	13½	14	15	16
Fig. 165A, Fig. 167A, flange diam., in.	12½	14	15	16¼	17½	20½

List 42½, Extra Heavy Gate Valves



FIG. 168



FIG. 169



FIG. 171

EXTRA HEAVY IRON BODY BRONZE MOUNTED GATE VALVES FOR STEAM AND WATER

Fig. 170 similar to Fig. 171 but with screw ends
250 lbs. working pressure. 600 lbs. test
Made in sizes from 2½ to 12 in.

Size, in.	2½	3	3½	4	4½
Fig. 168, Fig. 170, end to end, in.	7½	8	8¾	9¾	9¾
Fig. 169, Fig. 171, face to face, in.	9½	9½	10½	10½	11½
Fig. 169, Fig. 171, flange diam., in.	7½	8¼	9	10	10½

Size, in.	5	6	7	8	9	10
Fig. 168, Fig. 170, end to end, in.	10½	11½	12½	13½	13½	14½
Fig. 169, Fig. 171, face to face, in.	12½	13½	14	14	15	16
Fig. 169, Fig. 171, flange diam., in.	11	12½	14	15	16¼	17½

List 43, Extra Heavy Iron Body Gate Valves



FIG. 180



FIG. 181



FIG. 183

EXTRA HEAVY IRON BODY BRONZE MOUNTED GATE VALVES FOR STEAM AND WATER

Fig. 182 similar to Fig. 183 but with screw ends
Suitable for extra high pressure steam and water service of all kinds.
Extra heavy with iron bodies, caps and wheels and removable bronze seat rings. 300 lbs. working pressure. 800 lbs. test
Made in sizes from 2 to 24 in.

Size, in.	2	2½	3	3	4
Fig. 180, Fig. 182, end to end, in.	6½	8¾	9½	9½	10
Fig. 181, Fig. 183, face to face, in.	8½	9½	11½	11½	12
Fig. 181, Fig. 183, flange diam., in.	6½	7½	8¼	9	10

IRON BODY BRONZE MOUNTED GATE VALVES FOR STEAM AND WATER—(CONTINUED)

Size, in.	4½	5	6	7	8
Fig. 180, Fig. 182, end to end, in.	11½	12¼	13¾	14½	15
Fig. 181, Fig. 183, face to face, in.	13¼	15	15¾	16¼	16½
Fig. 181, Fig. 183, flange diam., in.	10½	11	12½	14	15

Size, in.	9	10	12	14	15	16
Fig. 180, Fig. 182, end to end, in.	16	16½	20¼	21¼	21½	21½
Fig. 181, Fig. 183, face to face, in.	17	18	19¼	21¼	21½	21½
Fig. 181, Fig. 183, flange diam., in.	16¼	17½	20½	23	24½	25½

List 58½, Iron Body Gate Valves



FIG. 250 BM



FIG. 251 BM

IRON BODY BRONZE MOUNTED DOUBLE DISK GATE VALVES

Designed for low pressure steam, water and gas
Sizes 10 to 24 in.—30 lbs. working pressure, 70 lbs. test
Sizes 26 to 72 in.—25 lbs. working pressure, 50 lbs. test

Size, in.	10	12	14	16	18	20	22	24	26
Fig. 250 BM, Fig. 251 BM, face to face, in.	10½	11	11½	12	12½	13	13¼	13¼	13½
Fig. 250 BM, Fig. 251 BM, flange diam., in.	16	19	21	23½	25	27½	29¼	32	34½

Size, in.	28	30	32	36	42	48	54	60	66	72
Fig. 250 BM, Fig. 251 BM, face to face, in.	14	15	15½	16	17½	19½	21	25	27	28½
Fig. 250 BM, Fig. 251 BM, flange diam., in.	36¼	38¾	41¾	46	53	59½	66¼	73	80	86½

List 59½, Iron Body Double Disk Gate Valves



FIG. 263



FIG. 261

IRON BODY BRONZE MOUNTED DOUBLE DISK GATE VALVES

Sizes 2 to 12 in.—125 lbs. working pressure, 300 lbs. test
Sizes 14 to 24 in.—75 lbs. working pressure, 175 lbs. test
Sizes 26 in. and above—60 lbs. working pressure, 150 lbs. test

Size, in.	2	2½	3	3½	4	4½	5
Fig. 261, Fig. 263, face to face, in.	7	7½	8	8½	9	9½	10
Fig. 261, Fig. 263, flange diam., in.	6	7	7½	8½	9	9½	10

Size, in.	6	7	8	9	10	12	14	16
Fig. 261, Fig. 263, face to face, in.	10½	11	11½	12	13	14	15	16
Fig. 261, Fig. 263, flange diam., in.	11	12½	13½	15	16	19	21	23¼

Size, in.	18	20	22	24	30	36	42	48
Fig. 261, Fig. 263, face to face, in.	15½	17	18	18½	21½	24½	27½	30½
Fig. 261, Fig. 263, flange diam., in.	25	27½	29½	32	38¾	46	53	59½

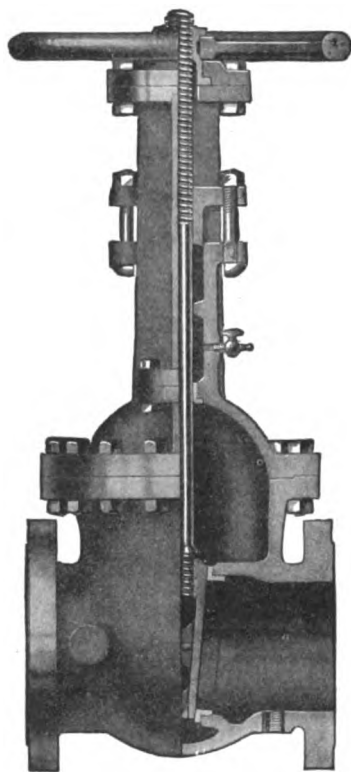
List 63½, Cast Steel Gate Valves for Superheated Steam

Specifications—Bodies and caps of cast steel, spindles of rolled monel, spindle seats and seat rings of cast monel. Valves up to 6-in. size, inclusive, have solid monel plugs—7-in. and above, cast steel plugs with monel faces rolled in by special process and guaranteed not to work loose.

Six bosses cast on each valve body so that tappings can be made in any desired position.

Caps made of long neck type allowing for radiation so that intense heat does not reach the packing, thus lengthening its life.

Also furnished with nickel bronze trimmings for boiler feed service, or can be arranged for electric or hydraulic operation.



CAST STEEL GATE VALVE FOR SUPERHEATED STEAM, PLUG OR WEDGE TYPE

350 lbs. working pressure, 800° total temperature

Size, in.	2	2½	3	3½	4	4½	5	6
Face to face, in.	8½	9½	11½	11¾	12	13¼	15	15¾
Flange diam., in.	6½	7½	8½	9	10	10½	11	12½

Size, in.	7	8	10	12	14	16	18	20
Face to face, in.	16¼	16½	18	19¾	22½	24	26	29¼
Flange diam., in.	14	15	17½	20½	23	25½	28	30½

List 108, Cast Steel Drilling Valves, 2500 lbs. Test

Specifications for Material—Body, Cap, Gates, Wedges—Cast steel; minimum tensile strength 65,000 lbs. per sq. in.; elastic limit not less than 45% of tensile strength.

Stuffing Box and Follower—Semisteel; minimum tensile strength 28,000 lbs. per sq. in.

Spindle, Bolts and Nuts—Special heat treated steel; minimum tensile strength 175,000 lbs. per sq. in.; elastic limit not less than 75% of tensile strength.

Gate and Seat Rings (if Bronze)—Special Chapman bronze; minimum tensile strength 35,000 lbs. per sq. in.; elastic limit not less than 50% of tensile strength.

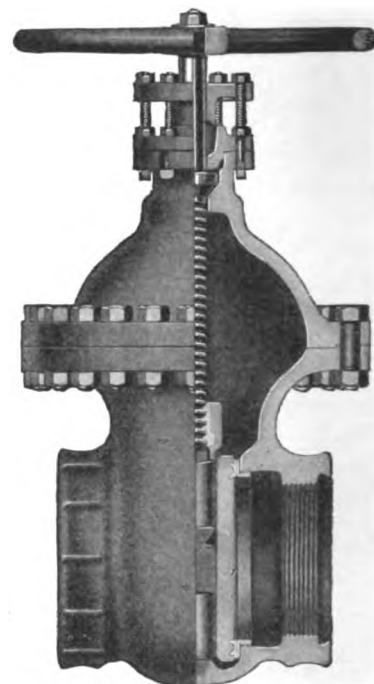
Gaskets—Extra special asbestos.

When ordering drilling valves be sure to specify diameter of gate opening, size of pipe and number and taper of threads.

SIZES, CAST STEEL DRILLING VALVES

Diam. gate opening, in.	Tapped for pipe, size, in.
14	13½
14	12½
14	11½
12½	11½
12½	10½
12½	10
12½	9½
10	9½
10	8½
10	8¼
10	8
10	7½
8	7½
8	7¼
8	6½
8	6¼

Prices and weights furnished on application.



CAST STEEL DRILLING VALVE
2500 lbs. test

List 76, Floor Stands



FIG. 436
Outside Screw Stand



FIG. 437
Inside Screw Stand

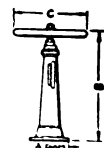


FIG. 438
Indicator Stand

FLOOR STANDS FOR VALVES AND SLUICE GATES
FIGS. 436 AND 436A

Size, in.	4 and less	4½ to 10	12 to 16	18 to 26	28 and above
Diam. base, in.	9½	14	14	16	16
Diam. bolt circle in base, in.	8¼	12½	12½	14½	14½
Number bolt holes in base	4	4	4	6	6
Diam. bolt holes in base, in.	11½	11½	11½	13½	13½
Height of stand, in.	28½	36	36	36	36
Diam. hand wheel, in.	12½	16	20	24½	30

FIGS. 437, 437A, 438 AND 438A

Size, in.	4 and less	4½ to 16	18 and above
Diam. base, in.	9½	14	16
Diam. bolt circle in base, in.	8¼	12½	14½
Number bolt holes in base	4	4	6
Diam. bolt holes in base, in.	11½	11½	13½
Height of stand, in.	28½	36	36
Diam. hand wheel, in.	12½	16	24½

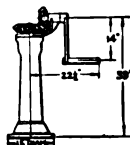


FIG. 439
LIGHT GEARED STAND,
SINGLE CRANK

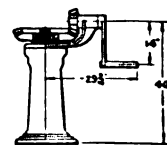


FIG. 440
HEAVY GEARED STAND,
SINGLE CRANK

VALVES FOR OIL AND NATURAL GAS

LIST 103

Fig. 503, Screwed end, inside spindle.

Fig. 504, Flanged end, inside spindle.

Fig. 505, Screwed end, outside spindle.

Fig. 506, Flanged end, outside spindle.

Sizes 2 to 16 in.

250 lbs. working pressure; 400 lbs. test.

Size, in.	2	2½	3	3½	4	4½	5	5½	6	6½	7	8	9	10	12
Fig. 503, Fig. 505, end to end, in.	7½	8	8½	9	9½	10	10½	11	11½	12	12½	13	13½	14	15½
Fig. 504, Fig. 506, face to face, in.	5½	6½	7	7½	8½	9½	10	11	11½	12½	13½	14	15	16	17½
Fig. 504, Fig. 506, flange diam., in.	6	7	7½	8½	9	9½	10	11	11½	12½	13½	14	15	16	19



FIG. No. 503



FIG. No. 504

LIST 104

Fig. 508, Screwed end, inside spindle.

Fig. 509, Flanged end, inside spindle.

Fig. 510, Screwed end, outside spindle.

Fig. 511, Flanged end, outside spindle.

Sizes 2 to 16 in.

400 lbs. working pressure; 600 lbs. test.

Size, in.	2	2½	3	3½	4	4½	5	5½	6	6½	7	8	9	10	12
Fig. 508, Fig. 510, end to end, in.	7½	8	8½	9	9½	10	10½	11	11½	12½	13½	14	15	16	17½
Fig. 509, Fig. 511, face to face, in.	7½	8	8½	9	9½	10	10½	11	11½	12½	13½	14	15	16	17½
Fig. 509, Fig. 511, flange diam., in.	6½	7½	8½	9	9½	10	10½	11	11½	12½	13½	14	15	16	19



FIG. No. 508

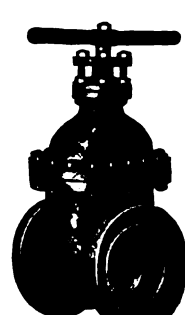


FIG. No. 509

LIST 105

Fig. 515, Screwed end, inside spindle.

Fig. 516, Flanged end, inside spindle.

Fig. 517, Screwed end, outside spindle.

Fig. 518, Flanged end, outside spindle.

Sizes 2 to 16 in.

500 lbs. working pressure; 1000 lbs. test.

Size, in.	2	2½	3	3½	4	4½	5	5½	6	6½	7	8	9	10	12
Fig. 515, Fig. 517, end to end, in.	7½	8	8½	9	9½	10	10½	11	11½	12½	13½	14	15	16	17½
Fig. 516, Fig. 518, face to face, in.	7½	8	8½	9	9½	10	10½	11	11½	12½	13½	14	15	16	17½
Fig. 516, Fig. 518, flange diam., in.	6½	7½	8½	9	9½	10	10½	11	11½	12½	13½	14	15	16	19



FIG. No. 515



FIG. No. 516

LIST 106

Fig. 520, Screwed end, inside spindle.

Fig. 521, Flanged end, inside spindle.

Fig. 522, Screwed end, outside spindle.

Fig. 523, Flanged end, outside spindle.

Sizes 2 to 16 in.

750 lbs. working pressure. 1500 lbs. test.

Size, in.	2	2½	3	3½	4	5	5½	6	6½	7	8	10	12
Fig. 520, Fig. 522, end to end, in.	7½	8	8½	9	9½	10	10½	11	11½	12½	13½	14	15
Fig. 521, Fig. 523, face to face, in.	7½	8	8½	9	9½	10	10½	11	11½	12½	13½	14	15
Fig. 521, Fig. 523, flange diam., in.	7	7½	8½	9	9½	10	10½	11	11½	12½	13½	14	15



FIG. No. 520

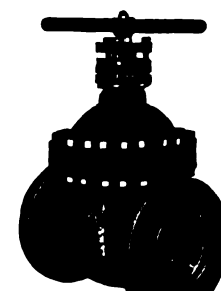


FIG. No. 521

LIST 107

Fig. 525, Screwed end, inside spindle.

Fig. 526, Flanged end, inside spindle.

Fig. 527, Screwed end, outside spindle.

Fig. 528, Flanged end, outside spindle.

Sizes 2 to 16 in.

1200 lbs. working pressure, 2000 lbs. test.

Size, in.	2	2½	3	3½	4	5	5½	6	6½	8	9	10
Fig. 525, Fig. 527, end to end, in.	7½	8	8½	9	9½	10	10½	11	11½	12½	13½	14
Fig. 526, Fig. 528, face to face, in.	7½	8	8½	9	9½	10	10½	11	11½	12½	13½	14
Fig. 526, Fig. 528, flange diam., in.	7	7½	8½	9	9½	10	10½	11	11½	12½	13½	14



FIG. No. 525



FIG. No. 526

CRANE CO.

Manufacturers of Valves and Fittings for any Pipe Line

836 South Michigan Avenue
CHICAGO, ILL.

FACTORIES: CHICAGO, ILL., and BRIDGEPORT, CONN.

BRANCH OFFICES

ABERDEEN	CHICAGO	INDIANAPOLIS	NEW ORLEANS	PORTLAND, ORE.	SPOKANE
ALBANY	CINCINNATI	KANSAS CITY	NEW YORK	ROCHESTER	SPRINGFIELD, MASS.
ATLANTA	DAVENPORT	KNOXVILLE	NEWARK	ROCKFORD	ST. LOUIS
BALTIMORE	DES MOINES	LIMA	OAKLAND	SACRAMENTO	ST. PAUL
BIRMINGHAM	DETROIT	LITTLE ROCK	OKLAHOMA CITY	SALT LAKE CITY	SYRACUSE
BOSTON	DULUTH	LOS ANGELES	OMAHA	SAN FRANCISCO	TACOMA
BRIDGEPORT	FARGO	MEMPHIS	OSHKOSH	SAVANNAH	TERRE HAUTE
BROOKLYN	GRAND RAPIDS	MINNEAPOLIS	PHILADELPHIA	SEATTLE	WASHINGTON
BUFFALO	GREAT FALLS, MONT.	MUSKOGEE	PITTSBURGH	SIOUX CITY	WICHITA

Products

VALVES: Regrinding Globe, Angle, Cross and Check; Extra Heavy Gate; Forged Steel Globe and Angle; Extra Heavy Hydraulic Cast Steel Gate; Crane-Erwood Automatic Double Acting Non-return and Emergency Cut-out.

FITTINGS: Screwed and Flanged, Cast Iron, Malleable Iron, Brass, Cast Steel and Forged Steel.

UNIONS: Ground Joints, Brass to Iron Seats.

UNION FITTINGS: Ground Joints, Brass to Iron Seats.

STRAINER and SEDIMENT SEPARATORS.

JOINTS: Flanged Pipe, Crane Expansion.

HEADERS: Cast Iron, Ferrosteel, Cast Steel.

EXTRA HEAVY STEAM and OIL SEPARATORS.

PIPE SUPPORTS, HANGERS and BRACKETS.

Also manufacturers of other Power Plant Specialties which include Traps: Cranetilt Steam and Vacuum; Fabricated Pipe and Bends; Valves: Pop Safety, Engine Stop, Exhaust Relief, Stop Check, Water Relief and Safety; Swivel Expansion Joints; Mine Piping; Pump Columns; Flanges; Bolts; Gaskets; Cocks for air lines; Pressure Regulators; Fittings: Screwed and Flanged, Sanitary Drainage, Long Sweep Water. Plumbing Fixtures.

20,000 articles, including valves and fittings from 1/8 in. to 72 in. Made of brass, cast iron, malleable iron, ferrosteel, cast steel and forged steel. For water pressures up to 6000 lbs., for steam pressures up to 400 lbs., any superheat, and for air pressures up to 2000 lbs.

Regrinding Globe, Angle, Cross, Check Valves

These valves are made of Crane special brass. They are fitted with our improved, non-heating malleable iron wheel and may be repacked when open and under pressure. The body is reinforced by a heavy union ring and when pressure is applied any tendency of the body to stretch is counteracted by this ring, and the contact between the body and the ring becomes more intimate as the pressure increases. Made in medium, extra heavy and hydraulic patterns.



No. 70 GLOBE VALVE

Extra Heavy Gate Valves, Outside Screw and Yoke

These valves are made of Crane ferrosteel with extra heavy hard metal seats which are screwed to shoulders in body, thereby insuring perfect joints. Seats can be removed at any time it may be necessary to renew them. The gate is made very stiff and is faced with hard metal. The guides in the gates are carefully finished, so as to slide smoothly on ribs in the body, thus

preventing any rattling when the valve is open, or any uneven wear of faces. Stuffing box flange is of malleable iron with a brass follower, giving additional strength and durability at that point. These valves may be packed when open. Tested to 800 lbs. hydraulic pressure per sq. in.

Forged Steel Globe and Angle Valves

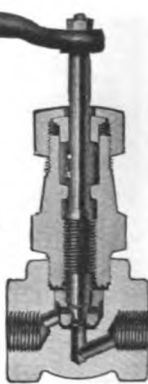
These meet the demand for a thoroughly reliable valve for use with hydraulic presses and extreme high pressure air or gas installations. The body is machined from a solid steel forging. The seat is easily renewable. These valves are recommended for cold water or oil working pressures up to 6000 lbs. hydrostatic. Valves for air or gas are special.



No. 9-E GATE VALVE

Extra Heavy Hydraulic Cast Steel Gate Valves

The bodies, bonnets, yokes and discs of these valves are made of Crane cast steel. In sizes above 2 in. the disc is faced with hard metal; size 2 in. has disc in solid hard metal. The construction of the seat and method of screwing it in the body, the strength and finish of the gate and stuffing box are similar to No. 9-E valve. Also they may be packed while under pressure. These valves are recommended for cold water or oil working pressures up to 3000 lbs. hydrostatic, and are tested to 3000 lbs. hydraulic pressure.



No. 225-H FORGED STEEL VALVE



No. 205-D GATE VALVE

Unions and Union Fittings

Made with leakproof brass to iron seat, requiring no gaskets, and may be taken apart readily. The seat is non-corrosive. Unions are made of malleable iron for steam working pressures up to 250 lbs. Union fittings are for 200 lbs. working pressure.



No. 519



No. 591



No. 596

UNIONS and UNION FITTINGS

Crane-Erwood Automatic Double Acting Non-return and Emergency Cut-out Valve

The principal duties of the Crane-Erwood valve are boiler protection, header protection, automatic cut in, line protection. These valves are extra heavy, made of ferrosteel with hard metal seats and discs and are recommended for steam working pressures up to 250 lbs. The levers on the outside of the valve are in line with the discs and give a positive indication of their position and the operation of the valve at all times. The valve may be adjusted to close within reasonable velocity limits. Adjustments are made from the outside while the valve is in operation.



No. 36-E
CRANE-ERWOOD
AUTOMATIC
VALVE

Hydraulic Malleable Iron Screwed Fittings

The Crane line of extra heavy hydraulic malleable iron fittings includes all the necessary sizes and shapes for cold water or oil working pressures as follows:

1 in. and smaller.....	2000 lbs. hydrostatic
1¼ to 2 in.....	1500 lbs. hydrostatic
2½ to 4 in.....	1000 lbs. hydrostatic
5 and 6 in.....	800 lbs. hydrostatic
8 in.....	600 lbs. hydrostatic
10 and 12 in.....	500 lbs. hydrostatic

These fittings are tested to hydraulic pressures corresponding to the above working pressures.



No. 260-H



No. 262-H



No. 264-H

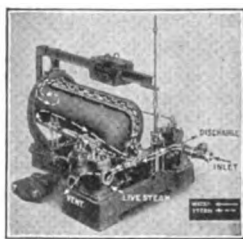


No. 267-H

HYDRAULIC FITTINGS

Cranetilt Steam Traps

Designed as non-return, boiler feed, lifting, vacuum or metering traps. They are especially adapted for use on return lines handling condensation under varying pressures, especially where the pressure will vary from a vacuum to high steam pressure. The Cranetilt three-valve trap gives excellent service on returns on apparatus that has a varying pressure while in service or a low initial starting pressure and a high terminal pressure. *Buy steam traps by their discharging capacity; not by pipe sizes.*



THREE-VALVE TRAP

Strainer and Sediment Separator

For water working pressures up to 250 pounds. These separators are constructed in a strong and substantial manner and will be found exceptionally valuable for use in connection with steam traps, pumps, injector and ejector suction pipes, feed water lines, etc., by preventing foreign substances from passing through and settling on valve seats and other places that should be kept entirely clear and free from such obstructions.



No. 989
SEDIMENT
SEPARATOR

Headers

CRANE Co. has exceptional facilities for making any required design of headers in cast iron, ferrosteel or cast steel, for all pressures and purposes.



CAST HEADER

Flanged Pipe Joints

With Crane cast steel or forged steel flanges these flanged joints are highly recommended for use in connection with pipe bends.



No. 281-D
Screwed Joint,
with Cast Steel
Flange



No. 295-E
Craneweld Joint,
with Forged
Steel Flange



No. 181-D
Cranelap Joint,
with Cast Steel
Flange

THREE STANDARD TYPES FLANGED PIPE JOINTS

Extra Heavy Steam and Oil Separators

Have large areas and ample baffle surfaces, affording the highest degree of efficiency with the slightest loss in pressure. Their design is based on the most approved mechanical and scientific principles. This superior line of separators is offered in competition with any steam or oil separating devices on the market.



No. 014

STEAM AND OIL SEPARATOR

Standard steam separators for steam working pressures up to 125 lbs.

Extra heavy steam separators for steam working pressures up to 250 lbs.

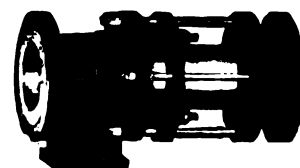
Cast steel steam separators for superheated steam working pressures up to 350 lbs. and total temperature of 800° Fahr.

Oil separators for steam working pressures up to 25 lbs.

Crane Expansion Joints

Are made in brass, copper, cast iron, ferrosteel and cast steel for all pressures and purposes.

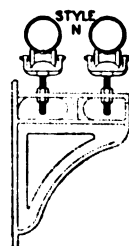
Expansion joints with anchor bases reduce the cost of installation.



No. 49-E EXPANSION JOINT
With anchor base

Pipe Supports, Hangers and Brackets

Are suitable for pipe lines up to 30 in.



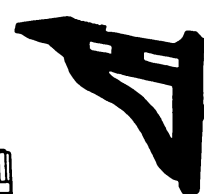
Style N



Style H



Style C



WALL BRACKET
With walking
board attachment

Literature

Catalogue No. 50, which describes complete line of products, will be mailed on request.

ESTABLISHED 1849

EDDY VALVE COMPANY

WATERFORD, N. Y.

AGENCIES IN ALL PRINCIPAL CITIES

Products

VALVES: Gate, Check, Foot, Lever and Float and Poppet Air Valves.

FIRE HYDRANTS.

TAPPING MACHINE SLEEVES and VALVES.

INDICATOR POSTS.

VALVE BOXES.

FLOOR STANDS.

SHEAR GATES.

Eddy for Long Service

Eddy products have been performing dependable service for many years. Their high reputation is due to the concentration of effort on the highest grade of workmanship and materials, and a highly efficient organization and plant.

FIG. 4
Screwed
Inside ScrewFIG. 5
Flanged**BRONZE TAPER SEAT DOUBLE GATE VALVES**

Recommended for 150 lbs. water pressure and 125 lbs. steam pressure. Sizes, $\frac{1}{4}$ to $2\frac{1}{2}$ in. Tested to 300 lbs.

FIG. 16A
Without Cap
and ChainFIG. 17B
With Bronze
Cap and Chain**BRONZE TAPER SEAT DOUBLE GATE HOSE VALVES**

Recommended for 150 lbs. water pressure. Tested to 300 lbs. Sizes $1\frac{1}{2}$ to $2\frac{1}{2}$ in.

FIG. 25
Screwed
Inside ScrewFIG. 26
Flanged**IRON BODY, BRONZE MOUNTED TAPER SEAT DOUBLE GATE VALVES**

Recommended for 150 lbs. water pressure and 100 lbs. steam pressure. Tested to 300 lbs. Sizes 2 to 48 in. Furnished with or without by-pass.

FIG. 27
Screwed
Sliding Stem and LeverFIG. 28
Flanged**IRON BODY, BRONZE MOUNTED TAPER SEAT DOUBLE GATE VALVES**

Recommended for steam or water; 100 lbs. working pressure. Tested to 300 lbs. Sizes, 2 to 12 in.

FIG. 35
Inside
ScrewFIG. 35A
Outside Screw
and YokeFIG. 303
TAPPING
MACHINE
SLEEVEFIG. 304
IRON BODY
BRONZE
MOUNTED
TAPPING
MACHINE
VALVE

Recommended for 150 lbs. water pressure. Tested to 300 lbs.

FIG. 64
FlangedFIG. 65
Bell EndsFIG. 66
Outside Screw
and YokeFIG. 67
Bell Ends

Iron Body, Bronze Mounted

PARALLEL SEAT DOUBLE GATE VALVES FOR STEAM AND WATER

Sizes 12 to 24 in. Recommended for 30 lbs. pressure; tested to 70 lbs. Sizes 26 to 72 in. for 25 lbs. pressure; tested to 50 lbs. Also made in all iron with steel stems for gas.

FIG. 69
FlangedFIG. 76
Bell EndsFIG. 73
FlangedFIG. 76A
Bell Ends

Iron Body, Bronze Mounted

PARALLEL SEAT DOUBLE GATE VALVES

Sizes 14 to 24 in. for 60 lbs. water pressure and 50 lbs. steam pressure. tested to 150 lbs. Sizes 30 to 48 in. Recommended for 50 lbs. water pressure and 40 lbs. steam pressure. Tested to 150 lbs. Furnished with or without by-pass.

FIG. 144
Screwed
Inside ScrewFIG. 145
FlangedFIG. 146
Screwed
Outside Screw and YokeFIG. 147A
Flanged

Iron Body, Bronze Mounted

EXTRA HEAVY PARALLEL SEAT DOUBLE GATE VALVES

Recommended for 250 lbs. steam pressure and 300 lbs. water pressure. Tested to 800 lbs. Sizes 2 to 20 in.

FIG. 148A
Flanged
Inside ScrewFIG. 147
Flanged
Outside Screw and Yoke

Iron Body, Bronze Mounted, with By-pass

EXTRA HEAVY PARALLEL SEAT DOUBLE GATE VALVES

Recommended for 250 lbs. steam pressure and 300 lbs. water pressure. Tested to 800 lbs. Sizes, 2 to 20 in.

FIG. 178A
ScrewedFIG. 179B
FlangedFIG. 150A
Flanged
with By-passFIG. 180
Bell
Ends

IRON BODY, BRONZE MOUNTED HORIZONTAL SWING CHECK VALVES

Recommended for 150 lbs. water pressure. Tested to 300 lbs. Sizes, 3 to 48 in.

By-pass valves are iron body, brass mounted, with inside screw or outside screw and yoke.



FIG. 184
Iron Body, Bronze Mounted
BALANCED GATE HORIZONTAL
SWING CHECK VALVE WITH BY-PASS
Recommended for 150 lbs.
water pressure. Tested to
300 lbs. Sizes, 4 to 20 in.

FIG. 188A
ScrewedFIG. 189A
Bell EndsFIG. 190A
Flanged

IRON BODY, BRONZE MOUNTED VERTICAL CHECK VALVES

Recommended for 150 lbs. water pressure. Tested to 300 lbs. Sizes, 4 to 30 in.

FIG. 268
Standard
FrameFIG. 269
Flanged
FrameFIG. 270
Bell End
FrameFIG. 270A
Spigot
Ends

SHEAR GATES

All iron. Sizes, 4 to 20 in. Furnished with bronze seat and gate rings, if desired.

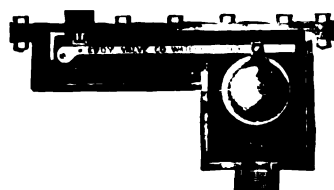


FIG. 246
Iron Body, Bronze Mounted
LEVER AND FLOOR AIR VALVES
For use at summits of pipe lines
to allow air, collected under pressure,
to escape

FIG. 191A
ScrewedFIG. 192A
Flanged

VERTICAL FOOT VALVES

Rubber faced gates, brass wire screens. Tested to 200 lbs. water pressure. Sizes, 4 to 36 in.

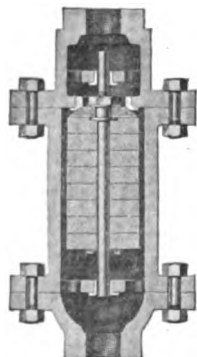


FIG. 195
Screwed
Iron Body, Bronze Mounted
AUTOMATIC POPPET AIR
VALVES

For same use as Fig. 246 shown above except that it is not for use where air is collected under pressure. Sizes, 1/4 to 3 in.



FIG. 254
PARALLEL SEAT
DOUBLE GATE
VALVE WITH
HYDRAULIC
CYLINDER
Cylinder piping
equipped with one
4-way control valve
or 4 independent
valves

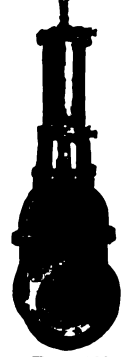


FIG. 130
PARALLEL SEAT
DOUBLE GATE
VALVE WITH
HYDRAULIC
LIFT

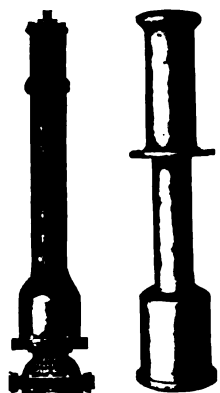


FIG. 211
ADJUSTABLE
VALVE BOX



FIG. 300
INDICATOR
POST



FIG. 307
CHAIN WHEEL
AND GUIDE

FIG. 295
Rising
StemFIG. 296
Stationary
StemFIG. 297
Stationary
Stem and
Indicator

HAND WHEEL FLOOR STANDS

FIG. 298A
Single CrankFIG. 299A
Double Crank

BEVEL GEARED FLOOR STANDS

Furnished with cranks as shown or with hand wheels. With or without ball bearings

Eddy Fire Hydrants

The valve is drawn, instead of pushed, to its seat and, being held in position from below, prevents the escape of water should the standpipe be broken off or the cover removed. Entire standpipe can be removed without shutting off water. The opening or closing of the hydrant valve causes the stem to raise or lower, thus indicating the position of the valve at all times. All parts are interchangeable. A damaged valve can be replaced by one man in a few minutes and at slight expense.



FIG. 220
With Bell
Connection



FIG. 221
With Auxiliary
Valve



FIG. 233
Mill Yard
Type

RUBBER FACED FIRE HYDRANTS

Literature and Service

Those who desire more detailed information regarding the full line of Eddy products will find it in the recent edition of Eddy Catalogue, which will be sent to interested persons on request.

The services of our engineers are at your disposal, without obligation, for a satisfactory solution of valve problems.

THE FAIRBANKS COMPANY

Valves and Unions

416 Broome Street
NEW YORK, N. Y.

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PARIS

Products

VALVES: Globe, Angle, Cross, Gate,
Swing Check and Blow-off.

UNIONS.

Fairbanks Bronze Globe, Angle and Cross Valves with Renewable Vulcabeston Ring Discs

For steam working pressures up to 150 lbs.
Sizes, $\frac{1}{8}$ to 3 in., screwed; $\frac{1}{2}$ to 3 in., flanged.

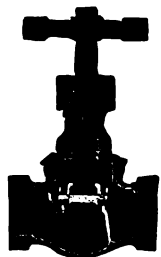
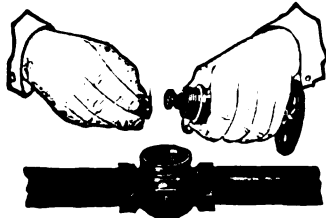


FIG. 01. BRONZE
GLOBE VALVE



SHOWING EASE OF RENEWING
DISCS
Slip old disc from end of spindle
and substitute a new one

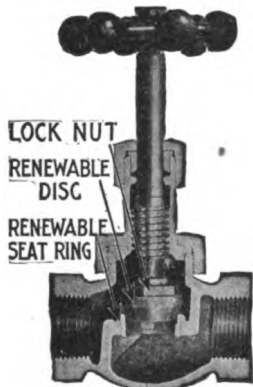
Fairbanks Bronze Regrinding Globe and Angle Valves with Renewable Discs and Seat Rings

For working pressures up
to 300 lbs.

Both the seat ring and disc
may be repaired or renewed,
thereby making the valve as
good as new at small cost and
without removing the body of
the valve from the pipe line.

Bronze seat and disc for
saturated steam; nickel seat
and disc for superheated steam.

Sizes, $\frac{1}{2}$ to 3 in., screwed.



BRONZE REGRINDING
GLOBE VALVE

Fig. 060. Bronze seat
Fig. 064. Nickel seat

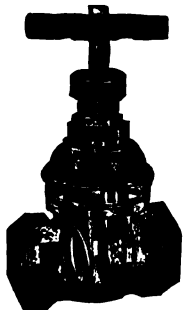


FIG. 0201. BRONZE
GATE VALVE

Fairbanks Bronze Gate Valves with Renewable Bronze Seat Rings

For steam working pressures up
to 150 lbs.

Renewals may be easily, quickly
and efficiently made when occasion
requires, without taking the valve
from the pipe line, by removing the
valve hub and unscrewing the re-
taining ring designed to hold the
seat rings accurately and firmly in
position.



TRADE-MARK

Made in inside screw and outside screw
and yoke types in the following sizes: In-
side screw, screwed ends, $\frac{1}{2}$ to 3 in.; flanged
ends, 1 to 3 in. Rising spindle outside screw
and yoke, screwed ends, $\frac{1}{2}$ to 2 in.; flanged
ends, 1 to 2 in.

Fairbanks Bronze Swing Check Valves

For steam working pres-
sures up to 150 lbs.

Straightway pattern gives
full pipe area.

Rotating disc can be re-
ground.

Can be used in horizontal
or vertical pipe.

Sizes, $\frac{1}{4}$ to 3 in., screwed.



FIG. 0601. BRONZE SWING
CHECK VALVE

Fairbanks Iron Body Globe, Angle and Cross Valves with Renewable Vulcabeston Disc Rings

For steam working pressures up to 150 lbs.

These valves have a raised round seat on which
scale, grit or sediment will not lodge. The standard
ring is composed of asbestos fiber to which a water-
proof vulcanizing material is added by a patented pro-
cess, making a durable composition which will not
crack nor flake off.

Made screwed or flanged
in the following sizes: Globe
and angle, 2 to 8 in. Cross, 2
to 6 in.

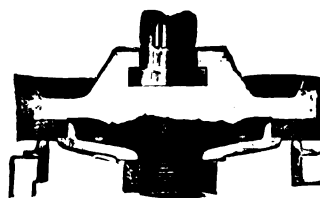
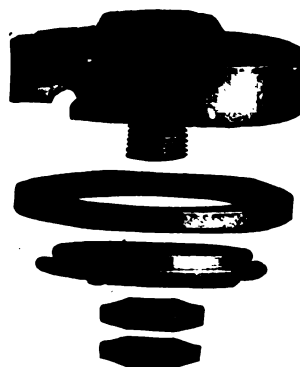


FIG. 0113. IRON HOLDER VUL-
CABESTON RING DISC

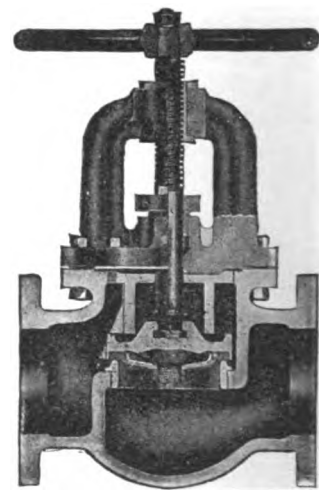


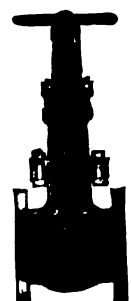
FIG. 0102. IRON BODY GLOBE
VALVE

Fairbanks Iron Body Gate Valves with Renewable Bronze Seat Rings

These valves have double taper solid wedge with bronze faces, with or without by-pass.

Made in inside screw and outside screw and yoke types, screwed or flanged, in three weights for steam pressures up to 150, 200 and 250 lbs.

Sizes, 2 to 12 in., screwed; 2 to 18 in., flanged.



SECTIONAL
VIEW OF
IRON BODY
GATE VALVE



SEAT RINGS
EASILY AND
QUICKLY RENEWED



FIG. 0313. IRON
BODY GATE
VALVE WITH
BY-PASS

Fairbanks Iron Body Swing Check Valves

Straightway pattern for steam working pressures up to 250 lbs. and water working pressures up to 350 lbs.

Sizes, 2 to 10 in., screwed; 2 to 12 in., flanged.

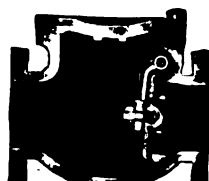


FIG. 0705. IRON BODY SWING CHECK VALVE



Fairbanks U-bolt Iron Gate Valves



FIG. 0414. U-BOLT IRON
GATE VALVE

For pressures not exceeding 100 lbs.

Made in all-iron type for oil, gas, acids, cyanides, etc., and in iron body bronze mounted type for ordinary uses on steam, water and air lines.

These valves will take pressure from either side and can be placed in any position. Render continuous satisfactory service.

Small number of parts; no complicated mechanism; easily and quickly taken apart for repairs or renewal of parts.

Sizes, $\frac{1}{2}$ to 3 in., screwed. Can be furnished with British standard pipe threads.

Fairbanks Sphero Valves

For steam working pressures up to 200 lbs.

Can be used as blow-off valves, or in rubber, soap and galvanizing plants, for marine, stationary or locomotive service and for oils, water, acids, etc.

The bodies are fitted with the well-known Vulca-boston rings incased in steel. The worm gear type is particularly suitable for digester work in paper mills.



PARTS OF A SPHERO VALVE

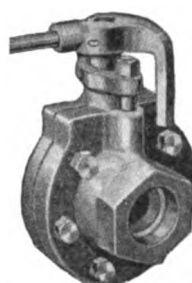


FIG. 0828. SPHERO
VALVE



SPHERO VALVE WITH WORM
GEAR ATTACHMENT

Made with screwed and flanged ends in sizes 1 to 4 in.

Furnished with worm gear attachments in 4-, 6- and 8-in. sizes, flanged.

Dart Unions

Made of malleable iron, plain or galvanized, with extra heavy pipe ends and heavy malleable iron nut. Bronze to bronze seats prevent corrosion and make a powerful union requiring no packing. Absolutely leak-proof and non-stretching. No cored parts; perfect threads.

Made in straightway pattern in sizes $\frac{1}{8}$ to 4 in.; flanged pattern in sizes $\frac{1}{2}$ to 12 in.; and elbow, tee and angle patterns in sizes $\frac{1}{4}$ to 3 in.

For high or low pressure steam, gas, water or air lines. Also made in all-iron for acids.

Samples sent on request.

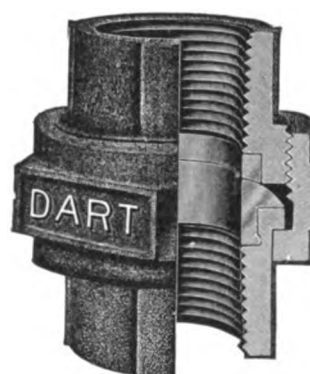


FIG. 0832. DART UNION

HOMESTEAD VALVE MANUFACTURING CO.

Manufacturers of Valves and Other Specialties

P. O. Box 1754
PITTSBURGH, PA.

WORKS
HOMESTEAD, PA.

Products

HOMESTEAD QUARTER-TURN VALVES for various pressures, in Brass, Semisteel Body, All-semisteel and Cast Steel.

HOMESTEAD STRAIGHTWAY VALVES, THREE-WAY VALVES, FOUR-WAY VALVES, ANGLE VALVES.

"HOVALCO" RENEWABLE BLOW-OFF VALVES.

Also, Locomotive Blow-off Valves.

Advantages

The simple construction gives the following advantages: The Homestead valve can be fully opened or closed with a quarter turn, which is important in times of emergency.

The straight and unobstructed passage through the Homestead valve, when open, makes it particularly suitable for the handling of heavy liquids or for carrying off sediment, as in the case of a blow-off valve.

The patent locking cam releases all pressure on the plug in turning, but locks the plug tight to the seat in the closed position.

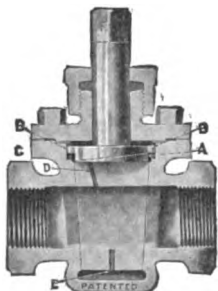
The seat is protected from wear when pressure is passing through valves.

Homestead Straightway Valves

Made in all sizes up to 6 in. and for all pressures up to 5000 lbs. per sq. in.

The Homestead valve is unlike all others, especially globe and gate valves, for the reason that when the pressure passes directly through it, the seat is absolutely protected from wear. The plug is balanced and held in place by the pressure when open, and when closed it is locked in the seat by the patent wedging cam, insuring freedom from friction in seat while plug is turning.

This valve is so constructed that when it is closed the plug at the same time is forced firmly to its seat. This result is secured by means of the traveling cam, A, through which the stem passes. The cam is prevented from turning with the stem by means of the lugs, B, which move vertically in slots. Supposing the valve to be open, the cam will be in the lower part of the chamber in which it is placed, and the plug will be free to be easily moved.



SECTION THROUGH
HOMESTEAD VALVE



FIG. 3. Flanged Connections
200 lbs. working pressure. All brass



FIG. 5. Screwed Connections
500 lbs. working pressure. Special high grade bronze

HOMESTEAD STRAIGHTWAY VALVES

200 LBS. WORKING PRESSURE. FLANGED CONNECTION. BRASS

Size, in.	1	1½	2	2½	3	3½	4
Flanged face to face	4½	5	6	7½	8	9½	12½
Diameter of flanges	3½	4½	5	6	7	8	9
Price	\$16.66	19.20	28.70	35.00	46.40	82.90	110.50
Drilling, net			\$0.15	.25	.40	.65	.75

HOMESTEAD STRAIGHTWAY VALVES—(Continued)

200 LBS. WORKING PRESSURE. SCREWED CONNECTION. BRASS

Size, in.	½	¾	1	1½	2	2½	3	3½	4
Ser. e. to e.	2½	2½	2½	3½	3½	4½	4½	6½	8½
Price	\$1.83	3.83	4.00	4.50	5.37	7.17	9.60	13.40	23.30

500 LBS. WORKING PRESSURE. SCREWED AND FLANGED CONNECTION. BRONZE

Size, in.	½	¾	1	1½	2	2½	3	3½	4
Screwed, end to end	2½	2½	2½	3½	3½	4½	4½	6½	8½
Flanged, face to face									
Price, screwed				\$5.00	7.30	9.16	11.70	16.80	23.30
Price, flanged									
Drilling, net									

BRASS VALVES FOR 1500 LBS. WORKING PRESSURE

Size, in.	½	¾	1	1½	2	2½	3
Ser. e. to e.	3½	3½	3½	5½	6	7	7½
Flg. f. to f.							
Price, screwed	\$6.40	6.40	10.60	15.60	24.20	31.30	41.90
Price, flanged							
Drilling, net							

VALVES FOR 3000 LBS. WORKING PRESSURE

Size, in.	½	¾	1	1½	2	2½	3
Screwed, end to end	5½	6	7	7½	9½	10	
Flanged, face to face	6	7	8	8½	11	11	
Price, screwed	\$15.96	29.76	38.26	53.13	63.76	73.13	116.86
Price, flanged							
Drilling, net							

VALVES FOR 5000 LBS. WORKING PRESSURE

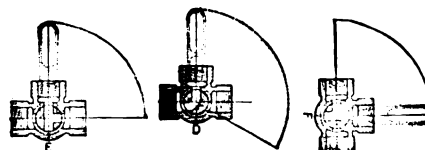
Size, in.	½	¾	1	1½	2	2½	3
Screwed, end to end	5½	6½	6½	7½	9½	10	11
Price, screwed	\$17.00	23.36	38.26	61.00	63.76	89.26	165.76
Price, flanged							
Drilling, net							

Homestead Three-way Valves

Suitable for various working pressures for either water, air or steam. Made according to same principle as Homestead straightway valves. They have the internal locking device, which forces the plug tight to seat of valve at both extremes of the arc in which plug turns.

Three arrangements of ports or openings shown can be used.

Valve with the two-port plug, shown in figure D, is used in majority of cases; and if not otherwise specified, is always shipped.



HORIZONTAL SECTIONS OF THREE-WAY VALVES

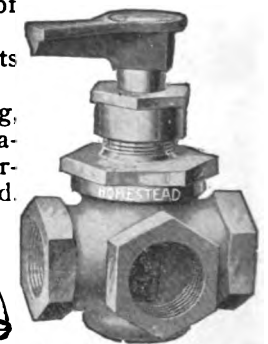


FIG. 9. HOMESTEAD THREE-WAY VALVE
Brass. 200 lbs. working pressure

HOMESTEAD BRASS THREE-WAY VALVES

200 LBS. WORKING PRESSURE

Size, in.	½	¾	1	1½	2	2½	3	4
Ser. e. to e. of run	2½	3	3½	4½	5½	6½	7½	10
Ser. cent. of run to end of side op'g	1½	1½	1½	2½	2½	3½	5½	5½
Price, ser.	\$6.34	6.67	9.90	15.80	19.30	22.90	36.60	60.80
Flg. f. to f. of run								
Diam. of figa.								
Price, figd.								
Drilling, net								

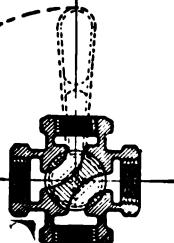
HOMESTEAD BRASS THREE-WAY VALVES—(Continued)

600 LBS. WORKING PRESSURE

Size, in.	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4
Ser., e. to e. of run	3 3/8	4 1/4	4 3/4	4 3/4	4 3/4	5 1/4	6 1/4	9	9 3/4	12 1/4
Ser., cent. of run to end of side opening	2 3/8	2 3/8	2 3/8	2 3/8	3 1/8	3 1/8	4 1/8	4 1/8	5	6 1/8
Price, screwed	\$10.00	12.20	20.00	24.33	31.26	36.03	47.83	71.73	119.56	208.26
Flgd., f. to f. of run				4 3/8	5 1/8	6 1/8	8	10	10 3/4	14 1/4
Diam. of flanges				4 3/8	5 1/8	6 1/8	8	10	10 3/4	14 1/4
Price, flanged				\$31.86	39.33	46.77	68.00	102.00	148.76	255.06
Drilling, net						\$0.15	.25	.40	.65	.75

Homestead Four-way Valves

The Homestead four-way valve is made to hold any pressure to and including 3000 lbs. It is made with the patent device which limits the plug to a quarter turn and forces it to its seat at each extreme of this quarter turn.



HORIZONTAL SECTION FOUR-WAY VALVE



FIG. 14. HOMESTEAD FOUR-WAY VALVE
For 600 lbs. working pressure

BRASS FOUR-WAY VALVES

600 LBS. WORKING PRESSURE

Size, in.	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3
Screwed, end to end	4 1/8	5	5 3/8	6 1/8	7 1/8	9 1/8	11 1/8	11 3/8	14 1/8
Price	\$12.77	20.10	25.10	45.10	51.00	64.60	90.90	122.10	180.60

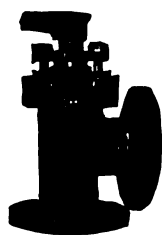


FIG. 16. HOMESTEAD ANGLE VALVE
200 lbs. working pressure, semisteel body

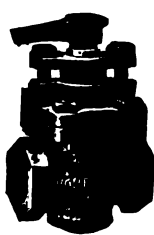


FIG. 17. HOMESTEAD STRAIGHTWAY VALVE
200 lbs. working pressure, semisteel body



FIG. 19. HOMESTEAD THREE-WAY VALVE

HOMESTEAD BRASS ANGLE VALVES

200 LBS. WORKING PRESSURE

Size, in.	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2
Screwed, outlet to face of inlet	1 1/2	1 3/4	2 1/4	2 3/4	2 3/4	3 1/4	4	4 1/4
Flanged, outlet to face of inlet								
Price, screwed	\$7.20	8.70	13.30	15.00	16.60	29.20	40.00	49.73
Price, flanged				\$18.30	20.80	35.83		

500 LBS. WORKING PRESSURE

Size, in.	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3
Price, screwed		\$8.33	10.00	15.83	18.33	23.33	33.33	50.00	
Price, flanged				\$23.33	25.00	30.00	46.66	73.33	123.33

Homestead Semisteel Valves

Homestead semisteel valves are used extensively on superheated lines. This is particularly true in the oil industry, where valves are used with entire success on vapors superheated to 700° Fahr. Homestead semisteel valves are also used on superheated steam lines in the power plant, where the results are at least equal to those usually obtained from cast steel valves.

HOMESTEAD SEMISTEEL BODY STRAIGHTWAY VALVES

200 LBS. WORKING PRESSURE

Size, in.	3/8	1	1 1/4	1 1/2	2	2 1/2	3	4	5	6
Ser., e. to e.	4 3/8	4 3/8	5	6 1/2	7 1/4	10	12 1/4	12 3/4	17 1/2	
Flgd., f. to f.	4 3/8	6 1/4	6 1/4	8 1/2	9 3/8	11	12 3/4	14	16	
Diam. of flg.	4 3/8	6	6	8 1/2	9 3/8	11	12 3/4	14	16	
Price, screwed	\$10.22	10.22	12.80	16.66	24.00	35.55	62.22	97.82	137.82	151.15
Price, flanged	\$12.22	12.22	15.55	20.00	31.69	47.55	82.22	120.00	166.66	217.77

HOMESTEAD SEMISTEEL BODY THREE-WAY VALVES

200 LBS. WORKING PRESSURE

Size, in.	1	1 1/4	1 1/2	2	2 1/2	3	4	5	6
Ser., e. to e. of run	4 3/4	5 3/8	6	6 3/4	9	10	12 1/4		
Ser., cent. of run to end of side opening	2 3/4	3 1/8	3 1/8	3 1/8	4 1/8	5 1/8	6 1/8		
Flgd., f. to f. of run	5 1/8	6 1/8	6 1/8	8	10	10 3/4			
Price, screwed	\$19.88	23.33	26.66	40.00	55.55	75.55	127.77	177.77	244.44
Price, flanged	\$26.66	31.11	34.66	52.76	75.60	100.05	155.55	200.00	271.15

HOMESTEAD ALL-SEMISTEEL STRAIGHTWAY VALVES

200 LBS. WORKING PRESSURE

Size, in.	1	1 1/4	1 1/2	2	2 1/2	3	4	5	6
Ser., end to end of run	4 1/8	4 1/8	5	6 1/8	7 1/8	10	12 1/8	12 3/8	17 1/8
Flgd., f. to f. of run	4 1/8	6 1/8	6 1/8	8 1/8	9 1/8	11	12 1/8	14	16
Diameter of flange	4 1/8	5	6	6 1/8	7 1/8	8 1/8	10	11 1/8	12 1/8
Price, screwed	\$10.66	14.67	16.00	21.92	36.00	60.00	88.00	124.00	170.00
Price, flanged	\$14.67	16.00	21.33	28.53	46.83	78.03	108.00	150.03	196.00

Similar to Fig. 3.

HOMESTEAD ALL-SEMISTEEL THREE-WAY VALVES

200 LBS. WORKING PRESSURE

Size, in.	1	1 1/4	1 1/2	2	2 1/2	3	4	5	6
Ser., end to end of run	4 3/4	5 3/8	6	7	9	10	12 1/4		
Ser., cent. of run to end of side opening	2 3/4	3 1/8	3 1/8	4	4 1/8	5 1/8	6 1/8		
Flanged, f. to f. of run	5 1/8	6 1/8	6 1/8	8	10	10 3/4			
Price, screwed	\$21.33	26.66	29.33	40.00	57.33	75.63	144.00	186.66	220.00
Price, flanged	\$26.66	32.00	34.66	47.04	64.00	85.33	160.00	202.64	244.00

HOMESTEAD ALL-SEMISTEEL FOUR-WAY VALVES

200 LBS. WORKING PRESSURE

Size, in.	3/8	1	1 1/4	1 1/2	2	2 1/2	3
Screwed, end to end of run		6	6 1/8	7 1/8	9 1/8	11 1/8	11 3/8
Price, screwed		\$23.68	42.35	48.00	60.80	77.33	114.93
Price, flanged							160.00

Homestead Cast Steel Valves

These valves are constructed on the same principle as the other Homestead valves described before. See data tabulated below.

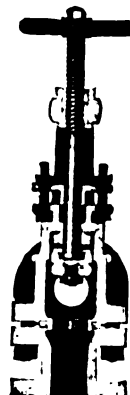
HOMESTEAD CAST STEEL VALVES

Size, in.	1	1 1/4	1 1/2	2	2 1/2	3	4	5	6
Screwed, end to end	4 3/8	4 3/8	5	6 1/8	7 1/8	10	12 1/8	12 3/8	17 1/8
Flanged, face to face	4 3/8	5 1/8	6 1/8	8 1/8	9 1/8	11	12 1/8	14	16
Price, screwed	\$16.00	24.00	26.66	48.00	66.66	146.66	242.66	266.66	333.33
Price, flanged	\$34.66	37.33	48.00	66.66	88.00	186.66	266.66	346.66	413.33
Drilling flanges, net			\$0.25	.35	.60	1.00	1.25	1.75	2.25

"Hovalco" Blow-off Valves

Exceptionally well constructed. Body is made of semisteel and seat and disk of special composition. Passage is free and unobstructed, and seat or disk can easily be removed, renewed or re-ground.

Once installed, valve should outlast the boiler.



SECTION OF "HOVALCO" BLOW-OFF VALVE



COMBINATION OF "HOVALCO" RENEWABLE BLOW-OFF VALVE AND HOMESTEAD QUARTER TURN VALVE

Designed for use in connection with the Homestead quarter turn valve when a double blow-off valve is required. Combination shown of these two valves is approved and used in many power plants today.

"HOVALCO." BLOW-OFF VALVES

250 LBS. WORKING PRESSURE

Size, in.	1 1/2	2	2 1/2	3
Price, screwed	\$22.00	27.00	32.50	41.00
Price, flanged	\$23.00	28.52	33.56	43.00

JENKINS BROS.

Manufacturers of Valves

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Products

VALVES: Globe, Angle, Cross, Check, Hose, Blow-off and Safety Valves; Rapid Action Valves; Radiator Valves in a variety of types; Air Valves; Fractional and Vacuum Valves; Extra Heavy Valves for high pressures, in Globe, Angle, Cross, Check, Blow-off, Automatic Equalizing Stop and Check, and other patterns; Gate Valves in standard, medium and extra heavy patterns; Valves in Brass, Iron Body, and Cast Steel, for all pressures and purposes; Back Pressure or Exhaust Valves; Marine Valves.

MECHANICAL RUBBER GOODS: Jenkins '96, Jenarco and Oiltite Sheet Packing and Gaskets, Gasket Tubing, Pump Valves, Jenkins Composition Valve Discs, and the like.

Also manufacturers of Steam Traps and Gage Cocks.

Jenkins service can only be expected from genuine Jenkins Valves—so, specify and install those carrying the Jenkins "Diamond" and signature.

Jenkins Valves, Standard Pattern

They represent a distinct type of valve as compared with regrinding, bevel or flat-seated valves. Instead of using a solid metal clapper, they contain a disc holder of brass or other suitable metal, and a removable disc of softer material, preferably Jenkins composition disc. This disc in service presents a slightly yielding surface to the valve seat and is flexible enough to adapt itself to any slight inequalities in the seat. A disc is easily removed and replaced with a new one.

Jenkins valves have full opening. They are made of a special high grade steam metal and contain, besides the Jenkins disc, other features found only in the genuine Jenkins valves.

Jenkins Brass Globe, Angle, and Cross Valves

Screwed or flanged, are regularly furnished with Jenkins No. 119 discs, suitable for 150 lbs. working steam pressure. When specified for cold water, valves are fitted with No. 93 discs, suitable for working water pressure up to 250 lbs. Regular sizes $\frac{1}{8}$ to 3 in. Larger sizes in brass made from iron body patterns.

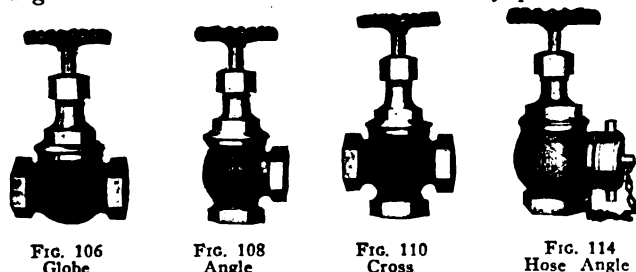


FIG. 106
Globe

FIG. 108
Angle

FIG. 110
Cross

FIG. 114
Hose Angle

BRASS VALVES, STANDARD PATTERN

Brass Check Valves, Standard Pattern—Jenkins brass horizontal, angle, and vertical check valves correspond to same standard as the standard pattern globe and angle valves. Regularly furnished with Jenkins disc of semi-hard composition which will soften slightly un-



der the action of hot water as required for boiler feed lines. When specified for cold water, air or gas, a softer and more flexible rubber disc is supplied, usually Jenkins No. 93 composition. Suitable for 150 lbs. working pressure. Sizes $\frac{1}{8}$ to 3 in., screwed or flanged.

Jenkins brass swing check valves, standard pattern, are made with globe shaped bodies, adapted for either horizontal or vertical installation; have renewable disc feature same as the horizontal pattern; and are suitable for same working pressures. Sizes $\frac{1}{8}$ to 3 in., screwed or flanged.



FIG. 117
Horizontal



FIG. 118
Angle



FIG. 119
Vertical



FIG. 352
Swing Check

BRASS CHECK VALVES, STANDARD PATTERN

Jenkins Y Valves—Besides extensive use for blow-off service, they are particularly desirable for handling muddy or gritty water. Have renewable seat rings and Jenkins discs; suitable for 150 lbs. working steam pressure, or 250 lbs. working water pressure. Brass valves, sizes $\frac{3}{8}$ to 3 in.; iron body valves, 2 to 8 in., inclusive.



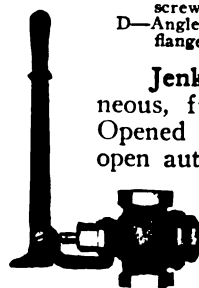
FIG. 124
BRASS Y VALVE

DIMENSIONS OF BRASS VALVES, STANDARD PATTERN

Size, in.	Fig.	A	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	1	1 $\frac{1}{4}$	1 $\frac{1}{2}$	2	2 $\frac{1}{2}$	3
Globe, screwed....	106	A	1 $\frac{1}{8}$	2 $\frac{1}{4}$	2 $\frac{3}{4}$	3 $\frac{1}{4}$	3 $\frac{3}{4}$	3 $\frac{1}{2}$	4 $\frac{1}{4}$	4 $\frac{3}{4}$	5 $\frac{3}{4}$	6 $\frac{3}{4}$	8 $\frac{1}{4}$
Globe, flanged....	107	B	2 $\frac{1}{4}$	3 $\frac{1}{4}$	3 $\frac{3}{4}$	4 $\frac{1}{4}$	4 $\frac{3}{4}$	4 $\frac{1}{2}$	5 $\frac{1}{4}$	5 $\frac{3}{4}$	6 $\frac{3}{4}$	7 $\frac{3}{4}$	9 $\frac{1}{4}$
Angle, screwed....	108	C	1 $\frac{1}{8}$	2 $\frac{1}{4}$	2 $\frac{3}{4}$	3 $\frac{1}{4}$	3 $\frac{3}{4}$	3 $\frac{1}{2}$	4 $\frac{1}{4}$	4 $\frac{3}{4}$	5 $\frac{3}{4}$	6 $\frac{3}{4}$	8 $\frac{1}{4}$
Angle, flanged....	109	D	2 $\frac{1}{4}$	3 $\frac{1}{4}$	3 $\frac{3}{4}$	4 $\frac{1}{4}$	4 $\frac{3}{4}$	4 $\frac{1}{2}$	5 $\frac{1}{4}$	5 $\frac{3}{4}$	6 $\frac{3}{4}$	7 $\frac{3}{4}$	9 $\frac{1}{4}$
Globe, ser. or fig.	106-107	G	2 $\frac{1}{4}$	3 $\frac{1}{4}$	3 $\frac{3}{4}$	4 $\frac{1}{4}$	4 $\frac{3}{4}$	4 $\frac{1}{2}$	5 $\frac{1}{4}$	5 $\frac{3}{4}$	6 $\frac{3}{4}$	7 $\frac{3}{4}$	9 $\frac{1}{4}$
Angle, ser. or fig.	108-109	G	2 $\frac{1}{4}$	3 $\frac{1}{4}$	3 $\frac{3}{4}$	4 $\frac{1}{4}$	4 $\frac{3}{4}$	4 $\frac{1}{2}$	5 $\frac{1}{4}$	5 $\frac{3}{4}$	6 $\frac{3}{4}$	7 $\frac{3}{4}$	9 $\frac{1}{4}$
Horis. check, ser.	117	A	1 $\frac{1}{8}$	2 $\frac{1}{4}$	2 $\frac{3}{4}$	3 $\frac{1}{4}$	3 $\frac{3}{4}$	3 $\frac{1}{2}$	4 $\frac{1}{4}$	4 $\frac{3}{4}$	5 $\frac{3}{4}$	6 $\frac{3}{4}$	8 $\frac{1}{4}$
Horis. check, fig.	120	A	2 $\frac{1}{4}$	3 $\frac{1}{4}$	3 $\frac{3}{4}$	4 $\frac{1}{4}$	4 $\frac{3}{4}$	4 $\frac{1}{2}$	5 $\frac{1}{4}$	5 $\frac{3}{4}$	6 $\frac{3}{4}$	7 $\frac{3}{4}$	9 $\frac{1}{4}$
Angle check, ser.	118	B	2 $\frac{1}{4}$	3 $\frac{1}{4}$	3 $\frac{3}{4}$	4 $\frac{1}{4}$	4 $\frac{3}{4}$	4 $\frac{1}{2}$	5 $\frac{1}{4}$	5 $\frac{3}{4}$	6 $\frac{3}{4}$	7 $\frac{3}{4}$	9 $\frac{1}{4}$
Angle check, fig.	120A	D	2 $\frac{1}{4}$	3 $\frac{1}{4}$	3 $\frac{3}{4}$	4 $\frac{1}{4}$	4 $\frac{3}{4}$	4 $\frac{1}{2}$	5 $\frac{1}{4}$	5 $\frac{3}{4}$	6 $\frac{3}{4}$	7 $\frac{3}{4}$	9 $\frac{1}{4}$
Horis. and angle	117-120A	GC	1 $\frac{1}{8}$	2 $\frac{1}{4}$	2 $\frac{3}{4}$	3 $\frac{1}{4}$	3 $\frac{3}{4}$	3 $\frac{1}{2}$	4 $\frac{1}{4}$	4 $\frac{3}{4}$	5 $\frac{3}{4}$	6 $\frac{3}{4}$	8 $\frac{1}{4}$
Vertical, screwed....	119	HC	1 $\frac{1}{8}$	2 $\frac{1}{4}$	2 $\frac{3}{4}$	3 $\frac{1}{4}$	3 $\frac{3}{4}$	3 $\frac{1}{2}$	4 $\frac{1}{4}$	4 $\frac{3}{4}$	5 $\frac{3}{4}$	6 $\frac{3}{4}$	8 $\frac{1}{4}$
Vertical, flanged....	120B	I	2 $\frac{1}{4}$	3 $\frac{1}{4}$	3 $\frac{3}{4}$	4 $\frac{1}{4}$	4 $\frac{3}{4}$	4 $\frac{1}{2}$	5 $\frac{1}{4}$	5 $\frac{3}{4}$	6 $\frac{3}{4}$	7 $\frac{3}{4}$	9 $\frac{1}{4}$
Y, screwed....	124	A	2 $\frac{1}{4}$	3 $\frac{1}{4}$	3 $\frac{3}{4}$	4 $\frac{1}{4}$	4 $\frac{3}{4}$	4 $\frac{1}{2}$	5 $\frac{1}{4}$	5 $\frac{3}{4}$	6 $\frac{3}{4}$	7 $\frac{3}{4}$	9 $\frac{1}{4}$
Y, flanged....	125	B	3 $\frac{1}{4}$	4 $\frac{1}{4}$	4 $\frac{3}{4}$	5 $\frac{1}{4}$	5 $\frac{3}{4}$	5 $\frac{1}{2}$	6 $\frac{1}{4}$	6 $\frac{3}{4}$	7 $\frac{3}{4}$	8 $\frac{3}{4}$	10 $\frac{1}{4}$
Y, screwed or fig.	124-125	G	3 $\frac{1}{4}$	4 $\frac{1}{4}$	4 $\frac{3}{4}$	5 $\frac{1}{4}$	5 $\frac{3}{4}$	5 $\frac{1}{2}$	6 $\frac{1}{4}$	6 $\frac{3}{4}$	7 $\frac{3}{4}$	8 $\frac{3}{4}$	10 $\frac{1}{4}$
Swing check, ser....	352	A	2 $\frac{1}{4}$	3 $\frac{1}{4}$	3 $\frac{3}{4}$	4 $\frac{1}{4}$	4 $\frac{3}{4}$	4 $\frac{1}{2}$	5 $\frac{1}{4}$	5 $\frac{3}{4}$	6 $\frac{3}{4}$	7 $\frac{3}{4}$	9 $\frac{1}{4}$
Swing check, fig....	353	B	3 $\frac{1}{4}$	4 $\frac{1}{4}$	4 $\frac{3}{4}$	5 $\frac{1}{4}$	5 $\frac{3}{4}$	5 $\frac{1}{2}$	6 $\frac{1}{4}$	6 $\frac{3}{4}$	7 $\frac{3}{4}$	8 $\frac{3}{4}$	10 $\frac{1}{4}$
Swing check, ser. or flanged....	352-353	GC	1 $\frac{1}{8}$	2 $\frac{1}{4}$	2 $\frac{3}{4}$	3 $\frac{1}{4}$	3 $\frac{3}{4}$	3 $\frac{1}{2}$	4 $\frac{1}{4}$	4 $\frac{3}{4}$	5 $\frac{3}{4}$	6 $\frac{3}{4}$	8 $\frac{1}{4}$

* A—Face to face, screwed.
B—Face to face, flanged.
C—Angle, center to face, screwed.
D—Angle, center to face, flanged.

G—Center to top of hand, wheel, open.
GC—Center to top of cap.
HC—Vertical, face to face, screwed.
I—Vertical, face to face, fig.



RAPID ACTION
VALVE

Jenkins Rapid Action Valve—Instantaneous, free, full flow is given by this Valve. Opened wide with quarter pull of lever. Stays open automatically. For use where a dependable, quick opening valve is required as: on washers in laundries; in bottling establishments, and for hydraulic presses. Modifications for other uses. Made of bronze with malleable iron lever, sizes $\frac{1}{2}$ to 2 $\frac{1}{2}$ in.

Jenkins Iron Body Valves, Standard Pattern

These are heavier and stronger than the average iron body valves. They have renewable seat rings and Jenkins discs; and are suitable for same working pressures as the standard pattern brass valves. Globe and angle valves made in sizes 2 to 24 in., inclusive; cross valves up to 8 in. Flanges A. S. M. E. standard dimensions.

Jenkins iron body horizontal, angle, vertical, and swing check valves made in sizes 2 to 10 in.; suitable for working pressures up to 150 lbs.

flexible rubber composition. For superheated steam they can be supplied with monel metal discs and seat rings.

The stuffing boxes are fitted with glands or followers, and are so arranged that they can be repacked when valves are wide open and under pressure. The large spindles are made of manganese bronze and have powerful acme standard threads.

The extra heavy horizontal, angle and swing check valves are equally heavy in design, and are guaranteed for 300 lbs. working pressure. Swing check valves can

DIMENSIONS OF IRON BODY, GLOBE, ANGLE, CHECK AND Y VALVES, STANDARD PATTERN

Size, in.	Fig.	*	2	2½	3	3½	4	4½	5	6	7	8	9	10	12	14	16	18	20	24
Globe, screwed.....	141	A	6½	7¾	9¾	10	12	12½	13¾	16	16½	18¾	20	21½	25¾	30½	34	38	42	50
Globe, flanged.....	142	B	7½	8	9½	10	11¾	12½	13¾	16	16½	18¾	20	21½	24½	30	34	38	42	50
Angle, screwed.....	143	C	3½	3¾	4½	5	6	6½	6¾	8	8½	9½	10	10½	12½	15¾	17	19	21	25
Angle, flanged.....	144	D	3¾	4½	4¾	5¾	5¾	6¾	6¾	8	8½	9½	10	10½	12½	15	17	19	21	25
Globe, screwed or fig.	141-142	G	9½	11	12½	13¾	14¾	15¾	17	18½	21	22	22½	24	29	32½	39½	40	42¾	47½
Angle, screwed or fig.	143-144	G	10½	11¾	13¾	14¾	15	15¾	17½	19	21¾	23	24	25	31	33	40½	41	45½	51¾
Horizontal check, scr.	151	A	6½	7¾	9¾	10	12	12½	13¾	16	16½	18¾	20	21½	25¾	30½	34	38	42	50
Horizontal check, fig.	153	B	7½	8	9½	10	11¾	12½	13¾	16	16½	18¾	20	21½	24½	30	34	38	42	50
Angle check, screwed..	152	C	3½	3¾	4½	5	6	6½	6¾	8	8½	9½	10	10½	12½	15¾	17	19	21	25
Angle check, flanged..	153A	D	3¾	4½	4¾	5¾	5¾	6¾	6¾	8	8½	9½	10	10½	12½	15	17	19	21	25
Horizontal and angle..	151-153A	GC	4	4½	5½	5¾	6¾	7	7½	9	9	10½	11	12½	14½	17¾	19	19½	23¾	
Swing check, screwed..	294	A	6½	7¾	9¾	10	12	12½	13¾	16	16½	18¾	20	21½	25¾	30½	34	38	42	50
Swing check, flanged..	295	B	7½	8	9½	10	11¾	12½	13¾	16	16½	18¾	20	21½	24½	30	34	38	42	50
Swing check, scr. and fig.	294-295	GC	3¾	4½	4¾	5¾	5¾	6¾	6¾	8	8½	9½	10	10½	12½	15	17	19	21	25
Y or blow-off, screwed.	296	A	8	9½	11½	13	13	15	16½	18¾	21¾	23½	25	27	30	34	38	42	50	
Y or blow-off, flanged..	297	B	9½	11	12½	15	14¾	16½	18¾	21¾	23½	25	27	30	34	38	42	50		
Y or blow-off, scr. or fig.	296-297	G	12	14	16	16½	18	21½	24½	28½	32½	36½	40½	44½	48½	52½	56½	60½	64½	68½

*A—Face to face, screwed.
B—Face to face, flanged.

C—Angle, center to face, screwed.
D—Angle, center to face, flanged.

G—Center to top of hand wheel, open.
GC—Center to top of cap.

HC—Vertical, face to face, screwed.
I—Vertical, face to face, flanged.



FIG. 142
Globe



FIG. 143
Angle

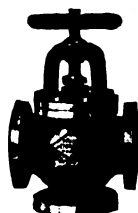


FIG. 146
Cross



FIG. 294
Check

IRON BODY VALVES, STANDARD PATTERN

be installed in horizontal or vertical position. Sizes ½ to 3 in.



FIG. 128
Globe



FIG. 129
Globe



FIG. 130
Angle

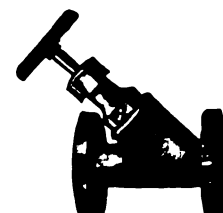


FIG. 135
Y or Blow-off

Jenkins All-iron Valves

These are recommended for service in places where, on account of possible corrosion, no brass mountings of any kind can be employed, as in the handling of solutions of cyanide, saltpetre, caustic potash, and the like.

All-iron globe and angle valves, with screwed bonnets, sizes ½ to 2 in.; with yoke, sizes to 2½ in. and up; horizontal and angle check valves, ½ in. and up.

All-iron gate valves with solid iron double face wedge, with screwed bonnets, sizes ¼, ⅜ and ½ in.; with bolted bonnets, ¾ in. and up.



FIG. 97
Gate



FIG. 79
Globe

ALL-IRON VALVES



FIG. 263
Horizontal
Check



FIG. 132
Angle
Check



FIG. 260
Swing
Check

BRASS GLOBE, ANGLE, Y AND CHECK VALVES, EXTRA HEAVY PATTERN

Size, in.	Fig.	*	½	¾	1	1½	2	2½	3
Globe, screwed.....	128	A	2½	2½	2½	3½	4½	5½	6½
Globe, flanged.....	129	B	3	3½	4½	5½	6½	7½	8½
Angle, screwed.....	130	C	1½	1½	1½	2½	2½	3½	3½
Angle, flanged.....	131	D	1½	1½	2½	2½	3½	3½	4½
Globe, screwed or flanged	128-129	G	4	4½	4½	6	6½	7½	8½
Angle, screwed or flanged	130-131	G	4	4½	4½	6	6½	7½	8½
Horizontal check, scr.	263	A	2½	2½	2½	3½	4½	5½	6½
Horizontal check, fig.	133	B	3	3½	4½	5½	6½	7½	8½
Angle check, screwed..	132	C	1½	1½	1½	2½	2½	3½	3½
Angle check, flanged..	133A	D	1½	1½	2½	2½	3½	3½	4½
Horizontal and angle..	263-133A	GC	2½	2½	2½	3½	4½	5½	6½
Swing check, screwed..	260	A	2½	2½	2½	3½	4½	5½	6½
Swing check, flanged..	262	B	3	3½	4½	5½	6½	7½	8½
Swing check, screwed or flanged	260-262	GC	2½	2½	2½	3½	4½	5½	6½
Y, screwed.....	134	A	3½	4½	4½	5½	6½	7½	8½
Y, flanged.....	135	B	4½	5	5½	6½	7½	8½	9½
Y, screwed or flanged..	134-135	G	5½	6½	7½	8½	9½	10½	11½

*A—Face to face, screwed.

B—Face to face, flanged.

C—Center to face, Angle, screwed.

D—Angle, center to face, flanged.

G—Center to top of hand wheel, open.

GC—Center to top of cap.

Brass Valves, Extra Heavy Pattern

The extra heavy pattern brass globe, angle, cross, and Y valves are suitable for working steam pressures up to and including 300 lbs., or for water and air pressures up to 500 lbs. Sizes ¼ to 3 in.

Regularly fitted with renewable steam metal discs for use in steam. When ordered for cold water, or air service, they are fitted with renewable Jenkins discs of

Iron Body Valves, Extra Heavy Pattern

The extra heavy pattern iron body globe, angle, cross and Y valves are suitable for 250 lbs. working steam pressure, or 400 lbs. working water pressure. The bodies, yokes and disc holders are high grade cast iron; the spindles are of manganese bronze; the renewable seat rings and disc of durable steam metal composition.

All flanged valves have $\frac{1}{8}$ -in. raised faces inside of bolt holes, and flange dimensions are in accordance with the American extra heavy standard. When drilling is ordered, it will also be in accordance with the American extra heavy standard, unless otherwise ordered.

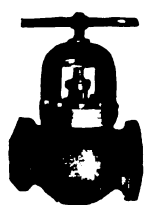


FIG. 162a
Globe, Screwed



FIG. 162
Globe, Flanged



FIG. 164c
Angle, Flanged

IRON BODY GLOBE AND ANGLE VALVES, EXTRA HEAVY PATTERN

DIMENSIONS OF IRON BODY GLOBE, ANGLE, CHECK AND Y VALVES, EXTRA HEAVY PATTERN

Size, in.	Fig.	*	2	2½	3	3½	4	4½
Globe, screwed.....	162A	A	7¾	9	10¼	11½	12¾	14
Globe, flanged.....	162	B	9	10	11¼	12½	13¾	14¾
Angle, screwed.....	163A	C	3¾	4½	5¼	5¾	6¾	7
Angle, flanged.....	163	D	4½	5	5¾	6¼	6¾	7¼
Globe, screwed or flanged.....	162A-162	G	12¾	14½	15¾	16¾	17¾	18¾
Angle, screwed or flanged.....	163A-163	G	14	15	16	17	18	19
Horizontal check, screwed.....	265	A	7¾	9	10¼	11½	12¾	14
Horizontal check, flanged.....	266	B	9	10	11¼	12½	13¾	14¾
Angle check, screwed.....	267	C	3¾	4½	5¼	5¾	6¾	7
Angle check, flanged.....	268	D	4½	5	5¾	6¼	6¾	7¼
Horizontal and angle.....	265-268	GC	4¼	4¾	5¼	5¾	6	6¾
Swing check, screwed.....	338	A	7¾	9	10¼	11½	12¾	14
Swing check, flanged.....	339	B	9	10	11¼	12½	13¾	14¾
Swing check, screwed or fig.....	338-339	GC	4¼	4¾	5¼	5¾	6	6¾
Y or blow-off, screwed.....	336	A	9	10½	12	13	14	15
Y or blow-off, flanged.....	337	B	10¾	12½	14	15	16	17
Y or blow-off, screwed or fig.....	336-337	G	14¾	16½	18½	20	21	22

Size, in. (continued)	Fig.	*	5	6	7	8	9	10	12
Globe, screwed.....	162A	A	15	17	18	19½	21	23	26
Globe, flanged.....	162	B	15½	17	18½	20	21¾	23	26
Angle, screwed.....	163A	C	7½	8½	9	9¾	10	11½	13
Angle, flanged.....	163	D	7¾	8½	9¼	10	10¾	11½	13
Globe, screwed or fig.....	162A-162	G	19¾	22½	23¾	25	26¾	28¾	32
Angle, screwed or fig.....	163A-163	G	20¾	23¾	24¾	25½	27	29¾	32½
Horizontal check, scr.....	265	A	15	17	18	19½	21	23	26
Horizontal check, fig.....	266	B	15½	17	18½	20	21¾	23	26
Angle check, screwed.....	267	C	7½	8½	9	9¾	10	11½	13
Angle check, flanged.....	268	D	7¾	8½	9¼	10	10¾	11½	13
Horizontal and angle.....	265-268	GC	6¾	7¾	8¾	9¾	10¾	12	14
Swing check, screwed.....	338	A	15	17	18	19½	21	23	26
Swing check, flanged.....	339	B	15½	17	18½	20	21¾	23	26
Swing check, scr. or fig.....	338-339	GC	6¾	7¾	8¾	9¾	10¾	12	14

*A—Face to face, screwed. D—Angle, center to face, flanged.
B—Face to face, flanged. G—Center to top of hand wheel, open.
C—Angle, center to face, screwed. GC—Center to stop of cap.

Cast Steel Valves

To meet the requirements of high pressure superheated steam and hydraulic service, JENKINS BROS. manufacture a line of cast steel valves. The globe, angle, and cross valves have bodies and bonnets of cast steel; and the spindles, seat rings, discs and disc rings are of monel metal. All connecting flanges are made with $\frac{1}{8}$ -in. raised faces inside of bolt holes. When ordered with flanges faced and drilled, the bolt holes will always be spot faced unless otherwise specified. Globe, angle, cross, and swing check valves in sizes 2 to 12 in., inclusive, suitable for working steam pressure up to 350 lbs., and temperatures to 800° Fahr.

Automatic Equalizing Stop and Check Valves

These valves are designed to shut off, automatically, the flow of steam from the header to a boiler in case a tube should burst or other internal rupture occur, thereby suddenly reducing the pressure in the boiler.

They also serve to equalize the pressure in a battery of boilers and prevent one boiler from working at a lower pressure than the others.

As the valves can only be opened by the pressure in the boiler, it is impossible to turn steam accidentally into a boiler which is being cleaned. To prevent chattering, the valve is cushioned by an internal dashpot, made of bronze, which eliminates all danger of sticking through corrosion. Each iron body valve is guaranteed for working steam pressures up to 250 lbs. When made with cast steel bodies and bonnets, and monel metal trimmings, they are suitable for 350 lbs. working steam pressure. Sizes 3 to 8 in.



FIG. 293
AUTO-
MATIC
EQUALIZ-
ING STOP
AND
CHECK
VALVE

Jenkins Gate Valves

All Jenkins gate valves are of the solid wedge, double face type. The bodies are globe shaped, a design which secures great strength, good proportion, and neat appearance. All patterns are made with inside screw, stationary spindle, or outside screw and yoke, rising spindle. The latter are particularly recommended for the higher pressures, as the spindle is more easily lubricated, increasing its durability. The traveling spindle also serves as an indicator, by means of which it can be seen at a glance whether the valve is open or closed. All the valves can be repacked under pressure when wide open, and all parts are renewable and interchangeable. The iron body and cast steel valves in the larger sizes are made with or without by-pass.

Valves can also be furnished with hub ends and square head stem, with spur, bevel, or special styles of gearing, with floor stands or indicator posts, and various other operating mechanisms.

Standard Pattern—Brass, sizes $\frac{1}{4}$ to 3 in. Iron body, sizes 2 to 30 in. For working pressures 125 lbs. steam, 175 lbs. water. All-iron, sizes, $\frac{1}{4}$ to 30 in.

Medium Pressure Pattern—Brass, sizes $\frac{1}{4}$ to 3 in. Iron body, sizes 2 to 18 in. For working pressures 175 lbs. steam, 250 lbs. water.

Extra Heavy Pattern—Brass, sizes $\frac{1}{2}$ to 3 in. Iron body, sizes $1\frac{1}{2}$ to 24 in. For working pressures 250 lbs. steam, 400 lbs. water.

Extra Heavy Pattern—Cast steel, sizes $1\frac{1}{2}$ to 24 in. For working pressures 350 lbs. steam, and temperatures to 800° Fahr.



FIG. 370
Standard Pattern



FIG. 372
Standard Pattern



FIG. 280
Extra Heavy Pattern

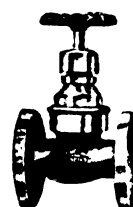


FIG. 281
Extra Heavy Pattern



FIG. 282
Extra Heavy Pattern

BRASS GATE VALVES

DIMENSIONS OF BRASS GATE VALVES

Size, in.	Fig.	*	1/4	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3
I. S., screwed.....	370	A	1 1/4	1 1/2	1 3/4	2 1/4	2 1/2	3	3 1/4	4	4 1/4
I. S., flanged.....	371	B	2 1/4	2 1/2	2 3/4	3 1/4	3 1/2	4 1/4	4 1/2	5 1/4	5 1/2
I. S., screwed or flanged.....	370, 371	G	3 1/4	3 1/2	3 3/4	4 1/4	4 1/2	5 1/4	5 1/2	6 1/4	6 1/2
O. S. and Y.....	368	H	4 1/4	4 1/2	4 3/4	5 1/4	5 1/2	6 1/4	6 1/2	7 1/4	7 1/2
O. S. and Y.....	368, 369	H	5 1/4	5 1/2	5 3/4	6 1/4	6 1/2	7 1/4	7 1/2	8 1/4	8 1/2
I. S., screwed.....	270	A	2 1/4	2 1/2	2 3/4	3 1/4	3 1/2	4 1/4	4 1/2	5 1/4	5 1/2
I. S., flanged.....	271	B	3 1/4	3 1/2	3 3/4	4 1/4	4 1/2	5 1/4	5 1/2	6 1/4	6 1/2
I. S., screwed or flanged.....	270, 271	G	3 1/4	3 1/2	3 3/4	4 1/4	4 1/2	5 1/4	5 1/2	6 1/4	6 1/2
O. S. and Y.....	275, 276	H	4 1/4	4 1/2	4 3/4	5 1/4	5 1/2	6 1/4	6 1/2	7 1/4	7 1/2
O. S. and Y.....	275, 276	H	5 1/4	5 1/2	5 3/4	6 1/4	6 1/2	7 1/4	7 1/2	8 1/4	8 1/2
I. S., screwed.....	280	A	2 1/4	2 1/2	2 3/4	3 1/4	3 1/2	4 1/4	4 1/2	5 1/4	5 1/2
I. S., flanged.....	281	B	3 1/4	3 1/2	3 3/4	4 1/4	4 1/2	5 1/4	5 1/2	6 1/4	6 1/2
I. S., screwed or flanged.....	280, 281	G	3 1/4	3 1/2	3 3/4	4 1/4	4 1/2	5 1/4	5 1/2	6 1/4	6 1/2
O. S. and Y.....	282, 283	H	4 1/4	4 1/2	4 3/4	5 1/4	5 1/2	6 1/4	6 1/2	7 1/4	7 1/2
O. S. and Y.....	282, 283	H	5 1/4	5 1/2	5 3/4	6 1/4	6 1/2	7 1/4	7 1/2	8 1/4	8 1/2

*A—Face to face, screwed. G—Center to top of hand wheel, open.
 B—Face to face, flanged. H—Center to top of spindle, rising spindle, open.

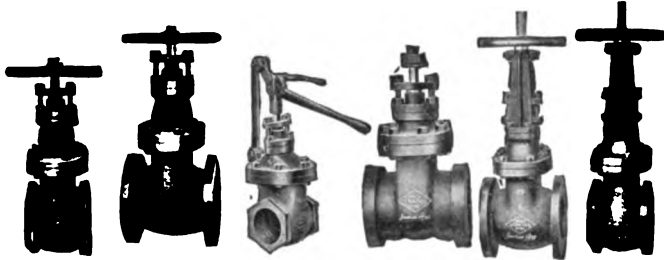


FIG. 325 Inside Screw
 FIG. 326 Inside Screw Flanged
 FIG. 334 Quick Opening Sliding Stem and Lever
 FIG. 327 Hub Ends
 FIG. 331 With Yoke, Flanged
 FIG. 330 With Yoke, Screwed

IRON BODY, COMPOSITION MOUNTED GATE VALVES STANDARD PATTERN

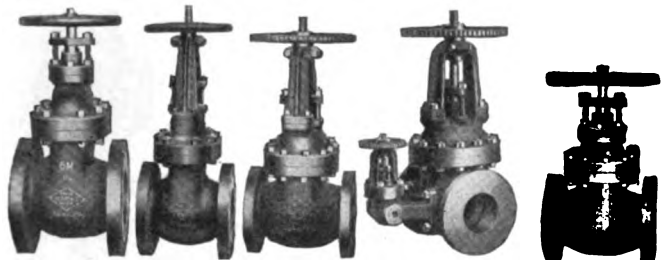


FIG. 225 Inside Screw, Stationary Spindle, Medium pressure
 FIG. 253 Outside Screw, Rising Spindle, Medium pressure
 FIG. 204 O. S. and Y. Rising Spindle without By-pass
 FIG. 204b O. S. and Y. Rising Spindle with By-pass
 FIG. 203 Inside Screw, Stationary Spindle

MEDIUM AND EXTRA HEAVY IRON BODY, COMPOSITION MOUNTED GATE VALVES

DIMENSIONS OF IRON BODY, COMPOSITION MOUNTED GATE VALVES, STANDARD PATTERN

Size, in.	Fig.	*	2	2 1/2	3	3 1/2	4	4 1/2	5	6
I. S. or O. S. and Y., screwed.....	325, 330	A	5 1/4	5 1/2	6 1/4	6 1/2	7 1/4	7 1/2	8 1/4	8 1/2
I. S. or O. S. and Y., flanged.....	326, 331	B	7 1/4	7 1/2	8 1/4	8 1/2	9 1/4	9 1/2	10 1/4	10 1/2
I. S., screwed or flanged.....	325, 326	G	10 1/4	11 1/4	13 1/4	14 1/4	15 1/4	16 1/4	18 1/4	20
O. S. and Y., screwed or flanged.....	330, 331	G	11 1/4	13 1/4	15 1/4	16 1/4	18 1/4	20 1/4	22 1/4	25 1/4
O. S. and Y.....		H	14	16 1/4	18 1/4	20 1/4	23 1/4	26 1/4	29 1/4	31

Size, in. (continued)	Fig.	*	7	8	9	10	12	14	15	16
I. S. or O. S. and Y., screwed.....	325, 330	A	8 1/4	8 1/2	9 1/4	9 1/2	11 1/4	11 1/2	12 1/4	12 1/2
I. S. or O. S. and Y., flanged.....	326, 331	B	11 1/4	11 1/2	12 1/4	12 1/2	14 1/4	14 1/2	15 1/4	15 1/2
I. S., screwed or flanged.....	325, 326	G	22 1/4	25 1/4	28 1/4	29 1/4	33 1/4	37 1/4	39 1/4	40 1/4
O. S. and Y., screwed or flanged.....	330, 331	G	28 1/4	31 1/4	34 1/4	36 1/4	43 1/4	51 1/4	53 1/4	58 1/4
O. S. and Y.....		H	36	39 1/4	42 1/4	48 1/4	57 1/4	66 1/4	69 1/4	74 1/4

Size, in. (continued)	Fig.	*	18	20	22	24	26	28	30
I. S. or O. S. and Y., screwed.....	325, 330	A	17	18	19	20	23	26	30
I. S. or O. S. and Y., flanged.....	326, 331	B	22 1/4	25 1/4	28 1/4	30 1/4	33 1/4	37 1/4	40 1/4
I. S., screwed or flanged.....	325, 326	G	46 1/4	49 1/4	53 1/4	60 1/4	63 1/4	68 1/4	73 1/4
O. S. and Y., screwed or flanged.....	330, 331	G	63 1/4	69 1/4	75 1/4	83 1/4	90 1/4	96 1/4	100 1/4
O. S. and Y.....		H	86	91	100	109	117 1/2	126	133

DIMENSIONS OF IRON BODY, COMPOSITION MOUNTED GATE VALVES

(MEDIUM PRESSURE)

Size, in.	Fig.	*	2	2 1/2	3	3 1/2	4	4 1/2	5	6	7
I. S. or O. S. and Y., screwed.....	251, 277	A	5 1/4	5 1/2	6 1/4	6 1/2	7 1/4	7 1/2	8 1/4	8 1/2	9 1/4
I. S. or O. S. and Y., flanged.....	255, 253	B	7 1/4	7 1/2	8 1/4	8 1/2	9 1/4	9 1/2	10 1/4	10 1/2	11 1/4
I. S., screwed or flanged.....	251, 255	G	11 1/4	12 1/4	14 1/4	15 1/4	16 1/4	17 1/4	19 1/4	21 1/4	22 1/4
O. S. and Y., screwed or flg.....	277, 253	G	11 1/4	12 1/4	14 1/4	15 1/4	16 1/4	17 1/4	19 1/4	21 1/4	22 1/4
O. S. and Y.....		H	14	15 1/4	18 1/4	20 1/4	23 1/4	25 1/4	28 1/4	31 1/4	35 1/4

Size, in. (continued)	Fig.	*	8	9	10	12	14	15	16	18	20
I. S. or O. S. and Y., screwed.....	251, 277	A	10	10 1/4	11 1/4	12 1/4	13 1/4	14 1/4	15 1/4	16 1/4	17 1/4
I. S. or O. S. and Y., flanged.....	255, 253	B	13 1/4	14 1/4	15 1/4	16 1/4	17 1/4	18 1/4	19 1/4	21 1/4	22 1/4
I. S., screwed or flanged.....	251, 255	G	20 1/4	21 1/4	23 1/4	25 1/4	27 1/4	29 1/4	31 1/4	33 1/4	35 1/4
O. S. and Y., screwed or flg.....	277, 253	G	31 1/4	34 1/4	38 1/4	43 1/4	49 1/4	52 1/4	57 1/4	63 1/4	69 1/4
O. S. and Y.....		H	40 1/4	44 1/4	49 1/4	56 1/4	64 1/4	68 1/4	74 1/4	82 1/4	90 1/4

(EXTRA HEAVY)

Size, in.	Fig.	*	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2
I. S. or O. S. and Y., screwed.....	203A, 204A	A	6 1/4	7	8	9	10	11	12 1/4
I. S. or O. S. and Y., flanged.....	203, 204, 386	B	7 1/4	8 1/4	9 1/4	10 1/4	11 1/4	12 1/4	13 1/4
I. S., screwed or flanged.....	203A, 203, 386	G	9 1/4	10 1/4	12 1/4	14 1/4	15 1/4	17 1/4	18 1/4
O. S. and Y., screwed or flanged.....	204A, 204, 388	G	10 1/4	11 1/4	14 1/4	16 1/4	18 1/4	20 1/4	22 1/4
O. S. and Y.....		H	12 1/4	13 1/4	17 1/4	20 1/4	22 1/4	24 1/4	27 1/4

Size, in. (continued)	Fig.	*	5	6	7	8	9	10	12
I. S. or O. S. and Y., screwed.....	203A, 204A	A	13 1/4	15 1/4	16 1/4	16 1/2	17	18	19 1/4
I. S. or O. S. and Y., flanged.....	203, 204, 386	B	15 1/4	16 1/4	17 1/4	17 1/2	18 1/4	19 1/4	20 1/4
I. S., screwed or flanged.....	203A, 203, 386	G	20 1/4	22 1/4	24 1/4	26 1/4	28 1/4	30 1/4	33 1/4
O. S. and Y., screwed or flanged.....	204A, 204, 388	G	24 1/4	27 1/4	30 1/4	34 1/4	37 1/4	41 1/4	47 1/4
O. S. and Y.....		H	30 1/4	34 1/4	38 1/4	42 1/4	47 1/4	52 1/4	60 1/4

Size, in. (continued)	Fig.	*	14	15	16	18	20	24
I. S. or O. S. and Y., screwed.....	203A, 204A	A	22 1/4	22 1/2	24	26	28	31
I. S. or O. S. and Y., flanged.....	203, 204, 386	B	27 1/4	28 1/4	30 1/4	32 1/4	34 1/4	37 1/4
I. S., screwed or flanged.....	203A, 203, 386	G	43 1/4	46 1/4	50 1/4	54 1/4	60 1/4	68 1/4
O. S. and Y., screwed or flanged.....	204A, 204, 388	G	53 1/4	57 1/4	62 1/4	68 1/4	74 1/4	82 1/4
O. S. and Y.....		H	68 1/4	75 1/4	84 1/4	91 1/4	108 1/4	124 1/4

*A—Face to face, screwed. G—Center to top of hand wheel, open.
 B—Face to face flanged. H—Center to top of spindle, rising spindle, open.

Mechanical Rubber Goods

This company offers engineering requisites which are the result of over fifty-seven years of progressive effort. They are the original manufacturers of rubber composition discs for valves and unvulcanized sheet packing.

Jenkins '96—A high grade unvulcanized rubber sheeting, suitable for saturated steam joints under high or low pressure, hot water, and other fluids.

Jenarco—A vulcanized red rubber sheeting, very tough and pliable, equally suitable for steam, hot or cold water, and other joints.

Oiltite—A sheet packing specially compounded for joints in lines carrying gasoline, kerosene, crude oil, etc.

SHEET PACKINGS

Approximate weights per sq. yd. 36 in. wide

Thickness	1/8	3/16	1/4	5/16	3/8	1/2
Jenkins '96 regular, lbs.....	2 1/4	5 1/4	8 1/4	11	16 1/4	22 1/4
Jenkins '96 brass wire insertion, lbs.....	8	10 1/4	13 1/4	19	25	31
Jenarco, regular, lbs.....	2 1/4	5 1/4	8 1/4	11	16 1/4	22 1/4
Jenarco, brass wire insertion, lbs.....	8	10 1/4	13 1/4	19	25	31
Oiltite, regular, lbs.....	2 1/4	5 1/4	7 1/4	10 1/4	15 1/4	21

Gaskets—Cut gaskets in any size or shape promptly supplied. If shape is irregular, send drawing or template.

Jenkins Compressed Asbestos Jointing—For high pressure and superheated steam. Compact, flexible, leatherlike jointing, proof against heat, steam, water, oils, acids, and alkalis.

Pump Valves—A few of the Jenkins service tested compounds:

No. 80—for hot water temperature above 180°.

No. 88—for warm water up to 175 lbs. pressure.

No. 93—for cold water pressures up to 175 lbs.

No. 94—for cold water, low pressures.

Any size and compound promptly supplied. When ordering always give outside diameter, thickness, and size of hole. When in doubt, mention service conditions.

THE KELLY & JONES CO.

Brass, Iron and Steel Valves and Fittings

WORKS
GREENSBURG, PA.

OFFICES

NEW YORK, N. Y., 2509-10-11 Park Row Building
PITTSBURGH, PA., 131-37 Water Street and 132-38 First Avenue
CHICAGO, ILL., 2436-62 West 15th Street

BUFFALO, N. Y., Ellicott Square

ST. LOUIS, MO., 705 Laclede Gas Building
CINCINNATI, OHIO, 1008-12 Sycamore Street
SAN FRANCISCO, CAL., Fifth and Bluxome Streets

Products

VALVES: Globe, Gate, Y, Safety, Blow-off, Swing Check, etc., of iron, steel, or brass bodies, screwed or flanged joints, for low, medium or high pressures.

PIPE EXPANSION JOINTS; PIPE UNIONS; FLANGED PIPE FITTINGS of cast iron, steel or brass.

Also manufacturers of Ammonia, Hydraulic and Drainage Pipe Fittings; Damper Regulators; Steam Traps; Acid Resistant, Hydraulic and Hose Valves.

Co-operative Service

We gladly offer the services of our engineers to the engineers using this catalogue, if in any way, by advice or suggestion, we can be of service to them.

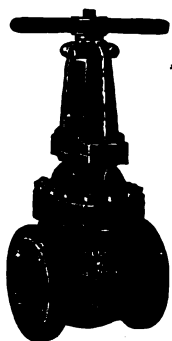
Catalogue "S" which describes and illustrates our complete line will be mailed on request.

Cast Steel Valves

As we operate our own steel foundry and control every operation from the foundry to the finishing department, we are in position to furnish steel valves absolutely uniform and of the highest quality.

The strength, elasticity, elongation, reduction and bending of the steel valves are in accordance with the strictest specifications.

Made in the following flanged patterns: Gate valves in all sizes from 1¼ to 24 in., and automatic globe and angle stop check valves in all sizes from 2 to 15 in., both patterns for superheated steam up to 350 lbs. pressure and a total temperature of 800° Fahr. Swing check valves in all sizes from 2 to 15 in. for water lines from 500 to 1000 lbs. working pressure. Hydraulic cast steel gate valves and swing check valves in all sizes from 2 to 6 in. for 3000 lbs. cold water working pressure.



Outside Screw and Yoke, Wedge Gate



Non-rising Stem



With By-pass

CAST STEEL VALVES, FLANGED



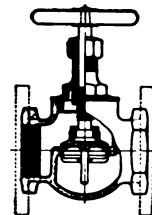
Iron Body Valves

Made in all sizes from 2 to 16 in., screwed or flanged, with or without yoke for 125, 175 or 250 lbs. working pressure.

Made in all styles, globe, angle, cross, gate, check, Y, safety, blow-off, and swing check, and are correctly designed with strength added where the greatest strain is caused. The material used in their construction is of the highest quality and each valve is carefully inspected and tested to pressure before shipment.



Extra Heavy Angle with Yoke



Standard Globe Inside Screw



Medium Angle with Yoke

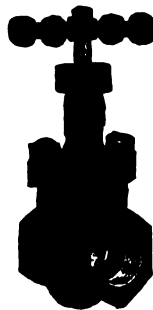
IRON BODY VALVES

Standard Iron Body Saddle Type Gate Valves—

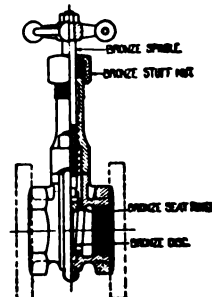
Can be furnished either black or red japanned, as desired.

This saddle style is a very durable and compact valve, and is economical owing to simplicity of construction. The steel saddle around body of valve holds bonnet securely in place, and can easily be removed, permitting of access to interior. Opens to left and has rising spindle. The solid disc is very narrow and V-shaped at bottom and can, therefore, be seated more readily when dirt or sediment is collected between the seats in the valve.

Suitable for 125 lbs. working pressure.



Solid Disc

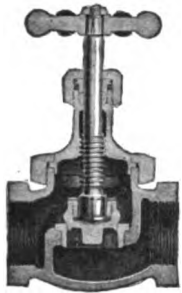


Wedge Gate

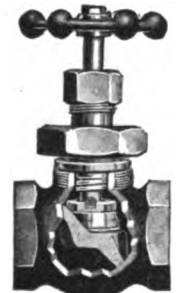
SADDLE TYPE STRAIGHTWAY GATE VALVES

Brass Valves

Regrinding "Excelsior" High Pressure Brass Valves—Designed to meet the demand for



Nickel Seat

Flanged
with Yoke

Globe



Angle

"EXCELSIOR" HIGH PRESSURE
BRASS VALVES

valves suitable for working pressures from 200 to 300 lbs. of live or superheated steam, and are extensively used in modern steam plant construction. The stuffing boxes can be packed while under pressure and valve reground while in position, without disturbing the pipe connections, by making slight adjustments and rotating the stem backward and forward.

Made of the highest grade metal and furnished in globe, angle, cross or check patterns. The outside screw and yoke pattern is recommended for superheated steam. The nickel seat style is so constructed as to permit of easy removal of the seat for renewal of purposes.

Brass Solid Wedge Gate Valves—Latest improved design, well proportioned and of good weight.

Special pattern for pressures up to 100 lbs.; standard for 125 lbs.; heavy for 150 lbs.; medium for 175 and 200 lbs.; extra heavy for 250 lbs.; and extra heavy hydraulic for 1000 lbs.



Standard

Outside
Screw and Yoke

Extra Heavy

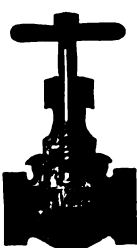


Solid Wedge

BRASS STRAIGHTWAY VALVES WITH SOLID WEDGES

Guides on discs and in bodies of these valves are fitted accurately, insuring a true and easy movement and preventing wear of the faces. Also keeps disc from touching seats in bodies except at closing point

Jenkins Type, Standard Kelly & Jones Brass Valves—Made of best grade steam metal, carefully machined, and are very attractive in appearance.



Globe



Angle



Y



Swing Check

JENKINS TYPE, STANDARD KELLY & JONES BRASS VALVES
Standard pattern for 125 lbs. pressure. Special pattern for 100 lbs.

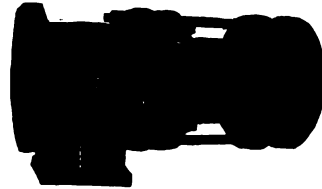
Of standard weight, and for a practical, durable, efficient and economical brass valve, these Jenkins type valves have no equal. Thousands in general use.

Expansion Joints

A complete line of expansion joints, all sizes, screwed or flanged for all pressures and purposes.

The extra heavy iron body pattern is recommended for 250 lbs. pressure and the extra heavy cast steel pattern for 350 lbs. superheated steam pressure.

Can be furnished with or without anchor base.



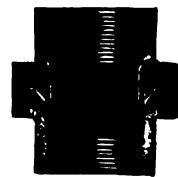
EXTRA HEAVY EXPANSION JOINT WITH ANCHOR BASE

Malleable Iron Unions

Malleable iron unions can be furnished in all sizes from $\frac{1}{8}$ to 4 in. for all pressures and purposes.

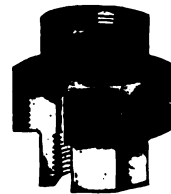
The "Nip" union is one of the simplest unions made, having only 3 parts—nut, swivel and thread end. The brass to iron seat insures a tight joint, and the brass to iron thread connection permits the union to be re-connected any number of times without injury. The straight bore or uniform diameter of the waterway insures a free passage—no pockets to collect sediment and choke up line.

The "Norustocta" union is a heavy, well made union, entirely copper covered, suitable for 250 lbs. working pressure and absolutely rustless.



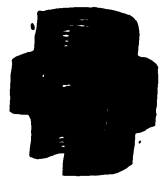
"Norustocta" Union

All parts completely covered with copper electrically applied



Nip Union

No inserted parts. The ring and bottom made of malleable iron, thread end of brass



Brass Seat Union

Round or octagon ends, iron or brass nut

MALLEABLE IRON UNIONS

Flanged Pipe Fittings

A complete line of flanged fittings is made, all sizes, straight or reducing, in cast iron, steel or brass for all pressures and purposes. Only the best grade of raw material is used in the manufacture of our line of flanged fittings.

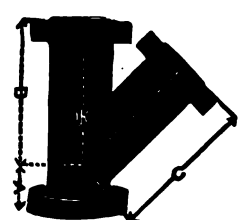
The machinework is carefully executed and dimensions are in accordance with the latest American Standard, adopted Jan. 1, 1915.



Elbow



Tee



Lateral

EXTRA HEAVY CAST IRON FLANGED FITTINGS

THE KENNEDY VALVE MFG. CO.

GENERAL OFFICES AND WORKS

ELMIRA, N. Y.

BRANCH OFFICES AND WAREHOUSES

NEW YORK, N. Y., 95 John Street—Telephone, Beekman 1430
BOSTON, MASS., 47 India Street

SAN FRANCISCO, CAL., 23-25 Minna Street
CHICAGO, ILL., 204-8 North Jefferson Street

SALES OFFICES

EL PASO, TEX.

SEATTLE, WASH.

SALT LAKE CITY, UTAH

EXPORT OFFICE: ELMIRA, N. Y.

Products

GATE, CHECK, GLOBE and ANGLE VALVES, for power, heating, fire protection, water supply, plumbing, etc.

Also manufacturers of Radiator and other Valves, and Fire Hydrants.



Guarantee

All Kennedy goods are thoroughly tested before leaving the works. Should any defects develop in proper use of goods in the service for which they are manufactured and sold, such goods will be replaced.

Catalogues

Complete catalogues will be sent on application.

Types of Gate Valves

Bronze valves 3 in. and smaller, and iron valves 1½ in. and smaller are made with solid wedge disks.

In the larger sizes it is necessary to have a feature of flexibility that will take up and automatically follow slight variations. This is provided by the double disk feature, operated by wedging mechanism.

feature, operated by a wedging mechanism.

All outside rising stem and yoke gate valves and inside stationary stem gate valves can be repacked while under pressure and open.

The wedging mechanisms used for operating Kennedy double disk gate valves are the "Cam," "Newtype" and "Lenticular" types.

The "Cam" type is simple—with the least possible number of working parts—and is for light and standard pressures, in sizes 2 to 12 in. inclusive, for which it is found to give the best service. Valves operate in any position.

The "Newtype" water gate type meets the requirements of water works.

Wedges, of solid bronze, act on both disks equally and independently of stem; always, therefore, being unimpaired and in perfect alignment. Wedging surfaces of wedges are of same angle and interchangeable. Disks can not stick, because bronze stem nut is thicker on one side than on the other; therefore, in opening valve, one disk lifts

The "Lenticular" type combines the flexible double disk principle with the wedge feature and center spreading control. This type is best for pressures greater than the ordinary, particularly for steam.

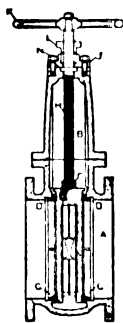


FIG. 8

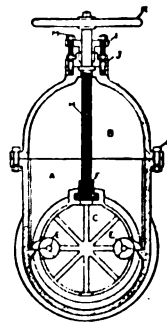


FIG. 9

SECTIONAL VIEWS OF KENNEDY "CAM" TYPE DOUBLE DISK PARALLEL SEAT GATE VALVE

"Standard" Bronze Gate Valves

Made with non-heating wheel.

Solid wedge disks are used in sizes up to 3 in., and double disk parallel seats 3½ in. and larger. Stem is stationary.

Sizes ¼ to 3 in. are for working pressures up to 150 lbs. water, or 125 lbs. steam; 3½ to 6 in. for working pressures up to 125 lbs. water, or 100 lbs. steam, and made with bolted bonnet.

With or without gland in stuffing box.

Medium and Extra Heavy Gate Valves

Made with non-heating wheel, solid wedge disk, and stationary stem. Gland follower in stuffing box. Fig. 37, medium pressure for water 250 lbs., steam, 200 lbs. Fig. 40, extra heavy for working steam pressures up to 250 lbs. and water pressures up to 300 lbs.



FIG. 27
"STANDARD"
BRONZE
GATE VALVE
SCREWED



FIG. 37
Medium Heavy



FIG. 40
Extra Heavy



Sectional View

MEDIUM AND EXTRA HEAVY GATE VALVES

Bronze Globe and Angle Valves

Made with non-heating wheel.

Fig. 134-135 in sizes ⅛ to 3 in. for 200 lbs. steam, or 225 lbs. Fig. 150 in sizes ¼ to 4 in. for working pressure of 150 lbs. water and 125 lbs. steam. Fig. 91 in sizes ¼ to 3 in. for working pressures of 175 lbs. water and 150 lbs. steam.



FIG. 134. REGRINDING
BRONZE GLOBE
VALVE



FIG. 150. STANDARD
BRONZE GLOBE
VALVE



FIG. 91. RENEWABLE
DISK HEAVY BRONZE
GLOBE VALVE

"Standard" Iron Body Gate Valves

Double disks, parallel seats, inside or outside rising stem and yoke with steel or bronze stem. The rising stem makes a positive indicator as to the extent the valve is open and admits of its being readily inspected, cleaned and oiled. It can be repacked under pressure.

Working pressures are as follows: 8 in. and smaller, 150 lbs. water, 125 lbs. steam; 9 to 14 in. (Fig. 59), 125 lbs. water, 100 lbs. steam; Figs. 60 and 61, 150 lbs. water, 100 lbs. steam; larger sizes for working pressures up to 100 lbs. water. Made with screwed, flanged, or bell ends.



FIG. 57. Screwed Inside Rising Stem



FIG. 58. Flanged Inside Rising Stem

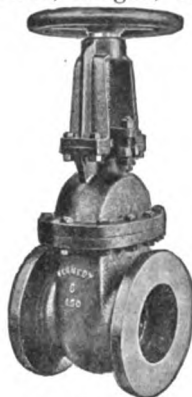


FIG. 61. Flanged Outside Rising Stem

"STANDARD" GATE VALVES**Medium Heavy Iron Body, Bronze Mounted "Lenticular" Gate Valves**

Suitable for working steam pressures up to 175 lbs. The outside rising stem makes a positive indicator as to position of valve (Fig. 75).

Stems of all sizes of Figs. 74 and 76, made of bronze of at least 50,000 lbs. tensile strength; and of steel, Figs. 75 and 77, although they can be furnished of bronze at a reasonable extra price.

Attention is called to the self-packing feature, both in the inside screw and outside screw and yoke type. Made with screwed or flanged ends.



FIG. 74. Inside Rising Stem Medium heavy



FIG. 75. Outside Rising Stem Medium heavy

"LENTICULAR" GATE VALVES**Extra Heavy Iron Body, Bronze Mounted "Lenticular" Gate Valves**

FIG. 76. Inside Stationary Stem Can be repacked under pressure



FIG. 77. Outside Rising Stem and Yoke with By-pass

EXTRA HEAVY "LENTICULAR" GATE VALVES**"Low Pressure" Gate Valves**

These are iron body, bronze mounted, or all-iron valves with steel stems. Equipped with "Newtype" disks, and are for lighter pressures than the "Standard" line. Those without ribs are tested to 30 lbs. and those for heavier service are more heavily ribbed.

Furnished with flanges of any practicable diameter and drilling.

Valves can be furnished to operate with chain instead of hand wheel. Sizes, 14, 16, 18, 20, 24, 30, 36, 42 and 48 in. Other dimensions on application.

Can be furnished with body clean-out pockets when so specified.



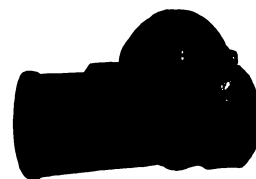
FIG. 48. "Low Pressure" GATE VALVE

Pennie Back-water and Sewer Gas Valve

For sealing the waste pipe against back-water, vermin, and gases in residences, public buildings, factories, etc.

Positive in action. Can be installed vertically, horizontally or inclined.

Made for standard or extra heavy soil pipe. Sizes, 2 to 12 in.



PENNIE BACK-WATER AND SEWER GAS VALVE

Heavy Iron Body, Bronze Mounted Globe and Angle Valves

For working pressures up to 125 lbs. steam, and 150 lbs. water. Renewable elastic disks and raised seats, insuring tight joint. Can be repacked under pressure. Of heavy design, with full size disk and area. Sizes, 2 to 10 in. Complete dimensions on request.

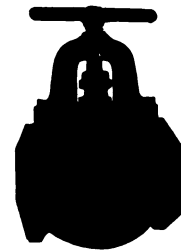


FIG. 100. SCREWED GLOBE VALVE

Swing Check Valves

Fig. 103 is for 125 lbs. steam and 150 lbs. water pressure. Screwed ends. Sizes, $\frac{3}{4}$ to 3 in. Fig. 107 is for working pressures up to 150 lbs. water, or 100 lbs. steam. Valves are straightway, having a direct passage-way of full area of pipe; disks revolve and are self-adjustable. Sizes, 2 to 24 in. made with flanged and bell ends as well.



FIG. 103. BRONZE SWING CHECK VALVE



FIG. 105. SCREWED, IRON BODY SWING CHECK VALVE WITH LEATHER FACED DISK

Bronze Regrinding Check Valves

Fig. 137 has horizontal lift disk and extra strong body. The regrinding feature permits seat to be renewed without disturbing pipe line. Sizes $\frac{1}{4}$ to 3 in. for maximum pressure of 200 lbs. steam, or 225 lbs. water. Fig. 133 in sizes $\frac{1}{2}$ to 3 in. for 125 lbs. steam or 150 lbs. water.

THE EDWARD VALVE & MANUFACTURING CO.

GENERAL OFFICES AND WORKS
EAST CHICAGO, IND.

EASTERN OFFICE, NEW YORK, N. Y., 50 Church Street.

WESTERN OFFICE, SAN FRANCISCO, CAL., Rialto Building.

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MONTREAL, QUE.
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PORTLAND, ME.
PORTLAND, ORE.
WILKES BARRE, PA.

RICHMOND, VA.
ST. LOUIS, MO.
SALT LAKE CITY, UTAH
SEATTLE, WASH.
SYRACUSE, N. Y.
TOLEDO, OHIO

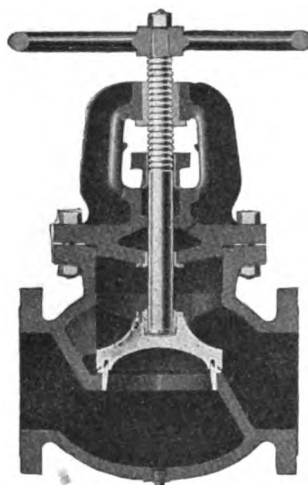
Products

VALVES: Globe and Angle Stop, Check, Non-return, Blow-off Drumhead Stop and Check, Atmospheric Relief; FORGED STEEL STOP VALVES; UNIONS and FITTINGS.

Also manufacturers of Regulators and Reducing Valves.

Edward Protected Seat and Disc

The Edward protected seat and disc, a feature of all Edward stop valves, affords absolute protection to the seating surfaces in that the high velocity and consequent erosive action of the steam when the valve is cracked does not occur across the seating faces. The protection is effected by retarding the flow across the seating faces until the seat and disc are separated to such an extent that the velocity of the steam is greatly reduced.



GLOBE AND ANGLE STOP VALVE,
No. 510, 511, 512, 513

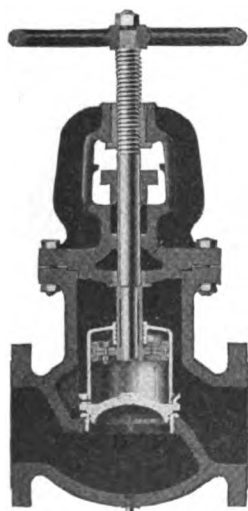


EDWARD PROTECTED SEAT
AND DISC

Stop Valves

For 300 lbs. pressure, 750° Fahr. Globe No. 510 and Angle No. 511, cast steel body and bonnet, monel metal trimmings.

For 250 lbs. pressure, 480° Fahr. Globe No. 512 and Angle No. 513, semisteel body and bonnet, steam bronze trimmings.



NON-RETURN VALVE, No.
501, 502, 503, 504,
505, 506, 507

Non-return Valves

For 300 lbs. pressure, 750° Fahr. Vertical No. 501, Globe

No. 504 and Angle No. 505, cast steel body and bonnet, monel metal trimmings.

For 250 lbs. pressure, 480° Fahr. Vertical No. 502, Globe No. 506 and Angle No. 507, semisteel body and bonnet, steam bronze trimmings.

Forged Steel Stop Valves

For 300 lbs. pressure, 750° Fahr. Globe No. 532 and Angle No. 533, forged steel body, bronze bonnet, monel metal trimmings.

For 400 lbs. pressure, 1100° Fahr. intermittent temperature. Globe No. 680 and Angle No. 681, forged steel body, bonnet and union ring, monel metal trimmings.

Bronze Stop Valves

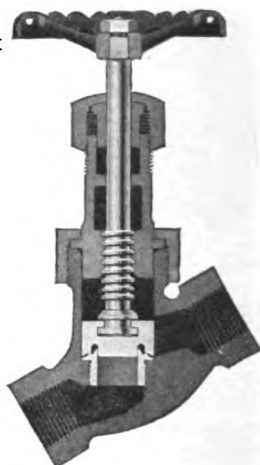
For 300 lbs. pressure, 600° Fahr. Globe No. 534 and Angle No. 535, bronze body, bonnet, monel metal trimmings.

Ferac Metal Valves

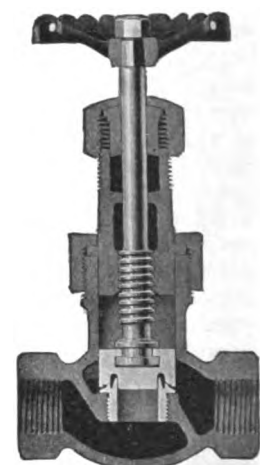
The Ferac metal valves are made in non-return, flanged and screwed globe and angle, blow-off and check valves. The Ferac line of valves is designed and built in accordance with the same standards of exactness which have characterized Edward products and will appeal to a class of users who do not find it necessary to invest in valve equipment designed for the most severe conditions.

Forged Steel Unions

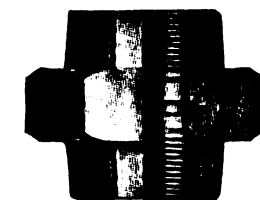
The Edward union is equipped with the Edward tight joint, assuring an absolutely tight joint.



FORGED STEEL STOP VALVE,
No. 532, 533



BRONZE STOP VALVE,
No. 534, 535



FORGED STEEL BOX
UNION, No. 595

THE LUDLOW VALVE MANUFACTURING CO.

Valves for Steam, Water, Gas and Oil

TROY, N. Y.

BRANCH OFFICES

CHICAGO, ILL., 633 The Rookery

PITTSBURGH, PA., First National Bank Building
KANSAS CITY, MO., R. A. Long Building

BOSTON, MASS., 112 Water Street

AGENCIES

NEW YORK, N. Y., 62 Gold Street
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Products

VALVES: Iron, Bronze and Steel; Steam, Water, Air, Natural Gas, Oil, Ammonia; Angle and Gate; Horizontal and Vertical Check; for either high, low or medium pressure.

FOOT VALVES; FIRE HYDRANTS.

Also, Sluice Gates, Shear Gates and Flap Valves.

Ludlow Double Gate Straightway Valves

Internal mechanism of valve consists of stem, two gates and two bevel faced wedges, the wedges being entirely independent of gates (or disks) and working between them, as shown in illustrations (Figs. 70 and 84).

Closing and Wedging—By action of stem, gates descend parallel with their seats until lower wedge strikes stop (or boss) in bottom of the case, gates and upper wedge continuing downward movement until face of upper wedge comes in contact with face of lower wedge. Face of upper wedge moves across face of lower wedge, exerting pressure on backs of both gates, forcing them apart and squarely against their seats (Figs. 70 and 84).

Opening—First turn of stem releases upper wedge, thereby releasing both gates from their seats *before they commence to rise*, thus eliminating all *grinding* and reducing to a minimum the wear on the faces of both gates and seats. *No other valve possesses this advantage.*

Construction—Metal used, both iron and bronze, is of highest grade. Gates can not, under Ludlow construction, be wedged or locked until they are directly opposite valve opening; stem can not bind in wedge; no stripping

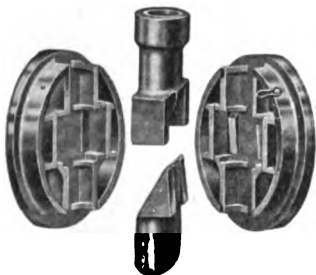


FIG. 84. STYLE OF GATES AND WEDGES FOR DOUBLE GATE VALVES

A, case; B, cover or bonnet; C, stem or spindle; D, packing plate or stuffing box; E, stuffing box gland or follower; F, stem nut; G, G, gates; H, gate rings; I, case rings; J, top wedge; K, bottom wedge; L, throat flange bolts; M, stuffing box or follower bolts

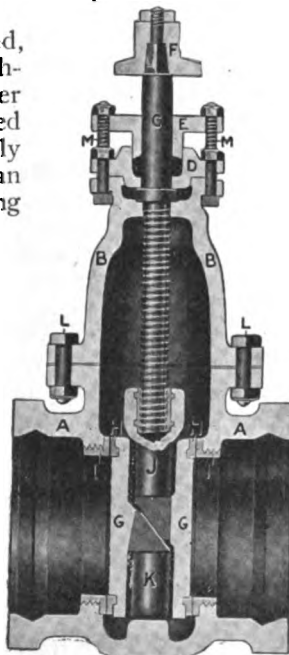


FIG. 70. LUDLOW BRONZE MOUNTED DOUBLE GATE VALVE

of thread from stem by canting of gates to either side.

Ground Seats—All Ludlow valves have gates ground to their seats, to secure best joints possible.

List No. 4, Double Gate Valves

For heavy pressures on either side of gate. Used for water, steam, gas, oil, ammonia, etc. Valves tested at 300 lbs. water pressure. Gates are adjustable with center bearings which absolutely prevent gates becoming wedged in case. Although shorter than other valves, metal is thicker and will stand heavier pressures. Valves made with flanged or screwed ends for steam, and with hub or spigot ends for water.

Recommended working pressures not exceeding, steam, 75 lbs.; water, 150 lbs. Sizes, 1 to 12 in.



FIG. 95. Flanged End Valve, with Bolted Packing Plate. Style above 6-in.



FIG. 96. Screwed End Valve, with Bronze Screwed Packing Box. Style 6-in. and under



FIG. 99. Showing Outside Screw and Yoke for screwed or flanged end valves

VALVES OF LISTS NOS. 1, 4, 5

List No. 5, Double Gate Valves

Valves have iron bodies and bronze mountings. Tested at 350 lbs. water pressure. Test *guaranteed*. For extra heavy working pressures either side of gate. All hub valves and all-iron valves have bolted stuffing box. These valves are also made with one end hub and other end spigot, or any other combination desired.

Recommended working pressures not exceeding, steam, 85 lbs.; water, 185 lbs. Sizes, 2 to 12 in.

List No. 5½, Double Gate Valves

Iron body with bronze mountings and all-iron. A first class steam gate valve made to withstand easily and safely a heavy working pressure up to 250 lbs. Tested at 600 lbs. water pressure. Test *guaranteed*. All parts, both iron and bronze, exceptionally heavy.

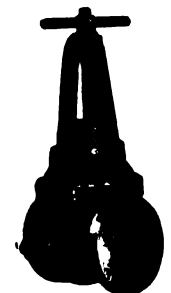


FIG. 102. LIST NO. 5½ OUTSIDE SCREW AND YOKE VALVE

Stuffing box can be repacked with gates fully open. Made in following styles: With inside screw, outside screw and yoke, bevel or spur gear, with by-pass, with loose flanges, flanges plain or grooved, and with screwed, flanged and hub ends.

Recommended working pressures not exceeding, steam, 250 lbs.; water, 400 lbs. Sizes, 1½ to 30 in.

List No. 30, Double Gate Valves

For water, steam, oil, natural gas. Similar in style and construction to valves in List No. 5½, except that these valves are made heavier by means of ribs to withstand greater pressure. Iron body with bronze mountings and all-iron. Tested at 1000 lbs. water pressure. Test *guaranteed*. Can be furnished with Dresser, Custer, Hammon or Dayton couplings.

Recommended working pressures not exceeding, steam, 275 lbs.; water, gas, 500 lbs.

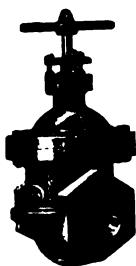


FIG. 221. Screwed End Valve

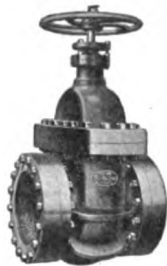


FIG. 222. Flanged End Valve with Loose Flanges Bolted On

LIST NO. 30 DOUBLE GATE VALVES

List No. 8, Double Gate Valves

Iron body with bronze mountings and all-iron. These valves have been on the market during many years. Thousands in use in this and other countries.

All parts extremely heavy. Tested at 1500 lbs. water pressure. All bolts are extra large. Stuffing box and follower are triple bolted, and the former is packed with special packing.

For extreme working pressures either side of gate. Recommended for working pressure not exceeding 750 lbs. Sizes, 1 to 14 in.



FIG. 12. LIST NO. 8 DOUBLE GATE VALVE

6-in. No. 8 valve with loose flanges bolted on

List No. 9, Double Gate Valves

For hydraulic work, natural gas, oil, etc. Iron body with bronze mountings and all-iron. Similar in design to valves in List No. 8, but heavier in every way for heavier working pressures. Used extensively on oil and natural gas lines; many still giving satisfaction after 35 years continuous service. Tested at 2000 lbs. water pressure. Gates and seats have ground faces, securing perfectly tight joints.

For extreme working pressures. Recommended for working pressure not exceeding 1200 lbs. Sizes, 1 to 14 in.



FIG. 14. LIST NO. 9 DOUBLE GATE VALVE

6-in. valve with loose flanges bolted on

List No. 6, Double Gate Valves

For heavy working pressures on either side of gate. Iron body with bronze mountings and all-iron. Designed for water, steam, gas, etc. More of these valves are in use in water works systems than any other valve on the market (Fig. 108). Superior to all other water works valves, for the reason that there is less wear on the face of the gates and seats in operation; they work easier under heavy pressure, last longer and require fewer repairs.

The gates are adjustable, with center bearings and can not become stuck in the case. Gates and seats have ground faces, thus insuring watertight and steamtight joints. They work equally well with pressure either side of the gate.

By-passes of any size furnished. Valves made with hub or spigot ends for water, with flanged ends for steam. Tested at 300 lbs. water pressure.

Recommended working pressure not exceeding, steam, 75 lbs.; water, 150 lbs. Sizes, 14 to 72 in.

List No. 1, Single Gate Valves

Iron body with bronze mountings and all-iron. For water, gas, etc. Used where double gate valves are unnecessary and pressure is not excessive. Gate and seat have ground faces, therefore watertight joints are assured. Tested at 200 lbs. water pressure.

Recommended working pressures not exceeding, water, 100 lbs. Sizes, 1 to 12 in.

List Nos. 2 and 3, Gate Valves

List No. 2 is single gate and List No. 3 is a double gate valve. Construction and method of wedging single gate valves are same as the double gate valves, except that one gate and one seat only have ground faces. For light working pressure steam, or medium pressure water or gas. Tested at 80 lbs. water pressure. For use where double gate valves are not desirable.

Recommended working pressures not exceeding, steam, 30 lbs.; water, 40 and 50 lbs. Sizes 14 to 72 in.

List No. 7, Bronze Double Gate Valves

For steam or water. These valves have been tested at these pressures per square inch: Water pressure, 6 in. and under, at 300 lbs.; 7 in. and above, at 250 lbs.

The metal in Ludlow valves is equal to that called for in Government work and, as to tensile and transverse strength, is superior to that used in other valves.

Valves made to bear a heavy working pressure.

Gates and seats have ground faces, thus insuring steamtight and watertight joints.

All sizes up to 6 in. inclusive have the screwed stuffing box and follower nut, unless otherwise specified; and all sizes above 6 in. have the bolted packing gland or follower.



FIG. 108. DOUBLE GATE HUB OR BELL END VALVE With spur gearing



FIG. 104. HUB OR BELL END VALVE Without gearing



FIG. 85. Screwed Cover and Rising Stem Box 1 in. 2½ to 6 in.



FIG. 87. Bolted Cover and Rising Stem Box 1 in. 2½ to 6 in.

Working pressures recommended should not exceed the following: Steam, 3 in. and under, 125 lbs., $3\frac{1}{2}$ to 6 in., 100 lbs., 7 to 12 in., 75 lbs.; water, 6 in. and under, 175 lbs., 7 in. and above, 125 lbs.

List No. 7 $\frac{1}{2}$, Extra Heavy Bronze Double Gate Valves

Recommended working pressures: Water, 6 in. and under, 400 lbs., and 7 in. and above, 300 lbs.; steam, 6 in. and under, 250 lbs., and 7 in. and above, 200 lbs.

These valves are also made for heavy pressure hydraulic work, working water pressure not to exceed 1000 lbs.



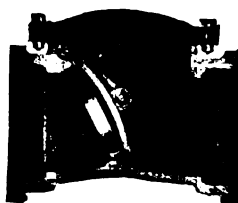
FIG. 153. LIST NO. 7 $\frac{1}{2}$ EXTRA HEAVY BRONZE DOUBLE GATE VALVE

List Nos. 11 and 12, Horizontal Swing Check Valves, Iron Body with Bronze Mountings

These valves are made with iron bodies, bronze mounted, are heavy and substantial. They are so constructed that bottom of the case is flattened and raised toward the seat, eliminating pockets or receptacles for stones or gravel. Gates in all sizes can be taken out by removing the cover or manhole plate.

Size 14 in. and above are made with by-pass. Tested, 24 in. and under at 300 lbs. per sq. in. water pressure; 30 in. and above at 250 lbs. per sq. in. water pressure.

Recommended working pressures: Steam, 24 in. and under, 75 lbs.; water, 24 in. and under, 150 lbs.; 30 in. and above, 125 lbs. Sizes, 2 to 48 in.



LIST NO. 11



LIST NO. 12. HORIZONTAL SWING CHECK VALVES, IRON BODY WITH BRONZE MOUNTINGS

List No. 12 $\frac{1}{2}$, Extra Heavy Horizontal Swing Check Valves

For use under heavy pressure. Made with iron bodies and are bronze mounted. Similar in construction to the valves in List Nos. 11 and 12, but heavier throughout. All parts extra strong. Tested at 600 lbs. water pressure. Sizes 14 in. and above made with by-pass; 12 in. and under made without by-pass.

Recommended working pressures: Steam, 24 in. and under, 200 lbs., 30 in. and above, 125 lbs.; water, 24 in. and under, 400 lbs., 30 in. and above, 200 lbs. Sizes, 2 to 20 in.

List No. 13, Vertical Check Valves

Iron body, gates faced with solid rubber disks, iron seat. Rubber is of best quality.

Made in two styles: 9 in. and under, with single gate; sizes above 9 in. are made with gate plate and nest of small gates varying in number according to size of valve, also with handholes for cleaning purposes.

Tested at 300 lbs. water pressure. Recommended working pressures not exceeding, for water, 150 lbs. Sizes, 2 to 30 in.

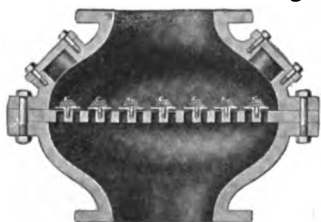


FIG. 127. VERTICAL CHECK VALVE
Screwed, flanged or hub ends

List No. 14, Vertical Foot Valves

Of similar construction to above vertical check valves. Iron body and iron gate plate. Gates faced with solid rubber. Sizes above 9 in. have, in addition to nest of small gates, a plate screen or strainer bolted to bottom of valves and made of heavy brass wire, also handholes. Sizes under 9 in. made with single gate, with basket screen or strainer. Tested at 100 lbs. water pressure (Fig. 128). Smaller types, with screen omitted, are adapted for service as vertical check valves. Recommended working pressure not exceeding, for water, 50 lbs.

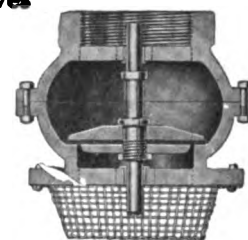


FIG. 128. VERTICAL VALVE
Screwed end

List No. 75, Ludlow Slide Gate Fire Hydrant

Gate type. A first class non-freezing hydrant, strong, simple in construction, tight under all pressures, with a positive drip that drains hydrant barrel completely. All working parts can be taken out without doing any digging or disturbing hydrant barrel.

Closing and Opening Hydrant Gate and Drip Valve—In closing, gate is moved downward by action of stem through threaded bronze wedge nut in back of gate (Fig. 131) until it strikes the stop at bottom of projection in back of hydrant, when, by action of bronze wedge nut, moving along incline on back of gate, it is forced squarely against its seat without any grinding movement on either rubber gasket, with which gate is faced, or on bronze seat ring, against which it closes; the projections at top and bottom of gate keeping rubber gasket away from seat ring until it is forced squarely against it by action of wedge nut. The final turn of stem, after gate is closed and wedged, opens drip valve.

In opening hydrant, first turn of stem closes drip valve, after which bronze wedge nut in back of gate is loosened, thus relieving gate from its seat.

Gate Locking Device—Consists of 2 lock nuts on stem below gate, which lock gate after it is closed, preventing street from being flooded in case hydrant barrel or standpipe is broken by accident.

Device, fully covered by patent, operates the instant gate is closed and drip is open and is released immediately upon starting to open hydrant.

Drip Valve—Bronze and faced with rubber, drip valve is screwed to lower end of hydrant stem and works in a bronze cup in extreme bottom of hydrant. Opens only *after* gate is closed and wedged; and closes *before* gate is released or any water enters barrel.

Fig. 131 shows location of drip valve which prevents freezing of hydrant. Valve does not open until after gate is closed and locked, shutting off water from hydrant barrel; and closes before gate is released from its seat, letting water into hydrant.

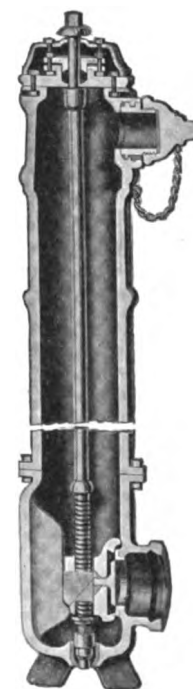


FIG. 131. LUDLOW SLIDE GATE FIRE HYDRANT

List No. 75, bronze mounted rubber faced gate. Sectional view showing gate closed and locked and drip valve in extreme bottom of hydrant open

THE LUNKENHEIMER COMPANY

Manufacturers of High Grade Engineering Appliances

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BOSTON, MASS., 136-138 High Street

CHICAGO, ILL., 568 West Washington Boulevard
LONDON, ENG., 35 Great Dover Street, S.E.

Products

VALVES: Bronze, Iron, Cast Steel, Globe, Angle, Cross, Check, Gate, Safety Non-return and Blow-off.

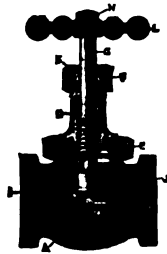
Also manufacturers of Anti-acid, Engine Throttle, Stop Check, Needle, Radiator, Regulating Check, Pop Safety and Relief Valves.

Oil and Grease Cups, Oil Pumps, Oiling Devices, Injectors and Ejectors, Water Columns and Gages, Gage Cocks, Whistles, Ground Key Work, Low Water Alarms, Fusible Plugs, Unions, Bronze Pipe Fittings.

Automotive Accessories: Generator Valves, Carburetor Check Valves, Gasoline Engine Primers, Priming Cups, Gasoline Strainers, Unions, Cocks, etc.

Lubricators for Steam, Gas, Gasoline and Diesel Engine and Compressor Cylinders.

Bronze Globe, Angle, Cross and Check Valves

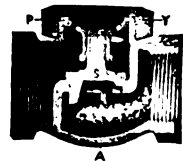


BRONZE RE-GRINDING GLOBE VALVE

Bodies and majority of trimmings are of Lunkenheimer "Valve-Bronze," a composition of Lunkenheimer origin, unexcelled for steam service.

Seating surfaces regrindable; all parts renewable; flow areas throughout bodies are in excess of nominal diameter of connecting pipes; stuffing boxes of stop valves repackable under pressure when valves are full open; assurance of proper seating of discs in check valves is warranted by the perfect guide provided.

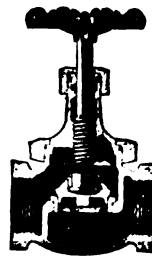
In addition to the above features, "Renewo" valves are provided with renewable seats and both seat and disc are made of Lunkenheimer "Valve-Nickel," a material especially formulated to counteract the severe service to which these parts are subjected.



BRONZE HORIZONTAL CHECK VALVE

Regrinding globe, angle and cross valves are furnished in 3 types: Inside screw, union bonnet; outside screw, screwed bonnet; outside screw, flanged bonnet. Sizes, $\frac{1}{8}$ to 6 in., inclusive, depending on the type.

"Renewo" globe, angle and cross valves are furnished in 2



BRONZE "RENEWO" GLOBE VALVE



BRONZE SWING CHECK VALVE

types: Inside screw, union bonnet; outside screw, flanged yoke bonnet. Sizes, $\frac{1}{4}$ to 3 in., inclusive.

Regrinding check valves are furnished in 2 styles: Screw cap and bolted cap. Sizes, $\frac{1}{8}$ to 4 in., inclusive, depending on the type.

Bronze Gate Valves

Double Disc Gate Valves—Rising stem, inside screw, for 150 lbs. pressure. Sizes $\frac{1}{4}$ to 3 in., inclusive.

Ball and socket bearing between discs provides greatest degree of flexibility in seating engagement. Double seated, permitting pressure to be taken from either end; all parts renewable; stuffing boxes repackable under pressure.



BRONZE DOUBLE DISC GATE VALVE



BRONZE WEDGE DISC GATE VALVE
Screwed bonnet

Wedge Disc Gate Valves—Furnished in 4 types: Stationary stem, inside screw, screwed bonnet (sizes $\frac{1}{4}$ to 3 in., inclusive), and rising stem, outside screw, screwed yoke bonnet (sizes $\frac{3}{4}$ to 3 in., inclusive), both in medium pattern for 200 lbs. pressure and extra heavy pattern for 300 lbs.; stationary stem, inside screw, flanged bonnet and rising stem, outside screw, flanged bonnet and yoke (sizes 2 to 8 in., inclusive), both in medium pattern for 125 lbs. pressure and extra heavy pattern for 250 lbs.

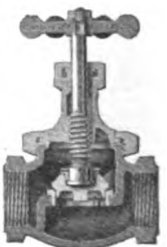


BRONZE WEDGE DISC GATE VALVE
Flanged yoke bonnet

Double seated, permitting pressure to be taken from either end; stuffing boxes repackable under pressure; all parts renewable.

Iron Body Globe, Angle, Cross and Check Valves

Bodies, yokes and caps are of Lunkenheimer "Valve-Iron" especially formulated for steam service, as is likewise the "Valve-Bronze" of which the majority of trimmings are made. "Valve-Nickel" is regularly used for seats and discs of "Ferrenewo" valves and on special order for outside screw and yoke types of iron body valves. Seating surfaces regrindable; all parts (including seats) renewable; flow areas throughout bodies are in excess of nominal diameter of connecting pipes; stuffing boxes of stop valves are repackable under pressure when



IRON BODY "FERRENEWO" GLOBE VALVE

valves are full open; proper seating of discs in check valves is assured by the perfect guide provided.

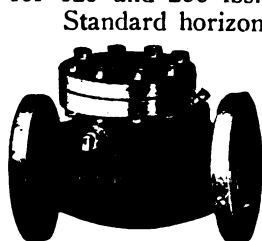
"Ferrenewo" valves are warranted for 150 lbs. working steam pressure. Sizes, $\frac{1}{4}$ to 2 in., inclusive.



IRON BODY
FLANGED YOKE
GLOBE VALVE

Iron body outside screw and yoke globe, angle and cross valves are furnished in standard pattern for 125 lbs. working steam pressure (sizes, 2 to 12 in., inclusive); extra heavy pattern for 250 lbs. (sizes, 2 to 6 in., inclusive, without by-pass; $3\frac{1}{2}$ to 12 in., inclusive, with interior by-pass; and 5 to 12 in., inclusive, with exterior by-pass).

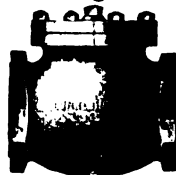
Horizontal, angle and swing check valves are furnished in standard and extra heavy patterns for 125 and 250 lbs. respectively.



IRON BODY SWING
CHECK VALVE

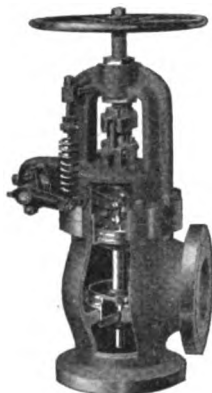
Standard horizontal and angle patterns are made in sizes 2 to 12 in., inclusive, and the extra heavy pattern from 2 to 6 in., inclusive.

Both patterns of swing check valves are made in sizes 2 to 8 in., inclusive.



IRON BODY
HORIZONTAL
CHECK VALVE

Iron Body Safety Non-return Valves



IRON BODY SAFETY
NON-RETURN
ANGLE VALVE

Sizes, 3 to 10 in., inclusive, for 250 lbs. pressure. Bodies and yokes of "Valve-Iron"; bearing parts of "Valve-Bronze." Will automatically close and instantly cut out the boiler in battery to which valve is connected should the pressure within the boiler suddenly drop below that in the header; permit continued operation of other boilers in battery; will not open until pressure in boiler equals that in header; can be connected with stems pointing vertically upward or horizontally; seating faces regrindable; all parts renewable. Also furnished with "Valve-Nickel" seats and discs or cast steel bodies and yokes with monel trimmings.



IRON BODY
"CLIP" GATE
VALVE

Iron Body Gate Valves

"Clip" Gate Valves—Furnished in 2 patterns: Inside screw for 100 lbs. pressure; quick opening for 50 lbs. Sizes, $\frac{1}{2}$ to 6 in., inclusive.

Regularly furnished in iron body bronze mounted pattern, but for handling cyanides and other acids they are furnished in the all-iron pattern. Double seated, thus will take pressure from either end; hub retained to body by steel "clip" which not only adds strength to the valve as a whole,



IRON BODY
"VICTOR" GATE
VALVE
Inside screw

but permits rapid assembling and disassembling for cleaning or repairs; stuffing boxes repackable under pressure.

"Victor" Gate Valves—Furnished in two types: Stationary stem, inside screw; rising stem, outside screw. Standard pattern for 125 lbs. pressure (sizes, 2 to 8 in., inclusive) and 100 lbs. (sizes, 10 to 24 in., inclusive); extra heavy pattern for 250 lbs., with or without by-pass (sizes, $1\frac{1}{2}$ to 16 in., inclusive).

Double seated, thus will take pressure from either end; all parts renewable; stuffing boxes repackable under pressure.

Also furnished in quick opening, power cylinder, gear or electric control and in all-iron patterns.

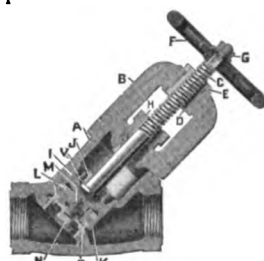


IRON BODY
"VICTOR" GATE
VALVE
Outside screw

Iron Body Blow-off Valves

Bronze "Renewo" Straightway or "Y" Blow-off Valves—Medium pattern for 200 lbs. pressure and extra heavy for 300 lbs. Sizes, $\frac{3}{4}$ to $2\frac{1}{2}$ in., inclusive.

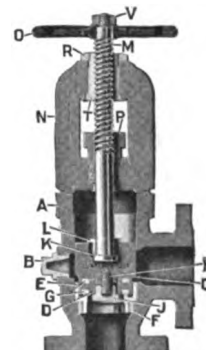
Bodies and majority of trimmings are of "Valve-Bronze," seats and discs of "Valve-Nickel." Seating surfaces are regrindable and self-cleaning; all parts renewable including seats and discs; stuffing boxes repackable under pressure.



IRON BODY STRAIGHTWAY
BLOW-OFF VALVE

Straightway or "Y" Blow-off Valves—Standard pattern for 125 lbs. pressure, extra heavy for 250 lbs. Sizes, $1\frac{1}{2}$ to $2\frac{1}{2}$ in., inclusive. Bodies, yokes and stuffing-box glands are of "Valve-Iron"; seat, stems and stem bushings of "Valve-Bronze"; iron discs with alloy faces. Self-cleaning seating surfaces; reversible discs provided with two alloy seating surfaces which can be melted out when worn and new alloy inserted; all parts renewable.

"Duro" Blow-off Valves—Sizes, $1\frac{1}{4}$ to $2\frac{1}{2}$ in., inclusive, for 250 lbs. pressure. Bodies and yokes of "Valve-Iron," bearing parts of "Valve-Bronze." Self-cleaning seating surfaces; discs reversible and provided with two alloy faces which can be melted out when worn and new alloy inserted; all parts renewable.



IRON BODY
"DURO"
BLOW-OFF VALVE

McNAB & HARLIN MFG. CO.

Manufacturers of Valves and Fittings

GENERAL OFFICE

Northeast Corner of John and William Streets

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WORKS AND SUPPLY HOUSE, PATERSON, N. J.

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BRASS, IRON BODY and SEMI-STEEL VALVES for all pressures and purposes.

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BRASS and IRON COCKS.

Also manufacturers of Engine and Boiler Trimmings, Hose Goods and Plumbers Brass Goods.

Quality of Materials

The quality of the materials used in the manufacture of McNab & Harlin brass and iron valves and fittings is determined by daily chemical and physical analysis, and these tests furnish invaluable data for the production of a uniform product.

Steam metal, or hard brass, used in the manufacture of these valves, valve seats and disks, has a tensile strength of 33,000 lbs. per sq. in., and is particularly adapted for high pressure and unusually severe service.

Equipment and Facilities

The installation of modern machinery and efficient methods enable this company to manufacture valves and fittings in the most satisfactory manner and with the least possible delay. A large and complete stock of all staple goods is carried at the factory at Paterson, N. J., insuring prompt shipments of all orders.

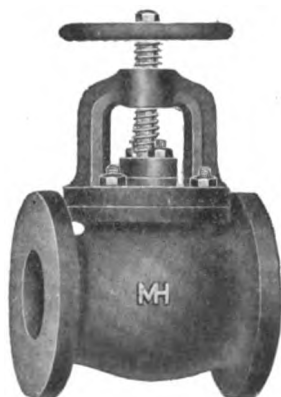
Catalogue

Our 1920 catalogue giving full and complete information about our line of valves and fittings will be sent on request.

Standard Iron Body Valves

Globe, Angle and Cross Valves—For steam working pressures up to 125 lbs. and water working pressures up to 175 lbs. May be packed under pressure when wide open. Unless otherwise ordered, furnished brass mounted; inside screw pattern in sizes 1½ to 3 in., inclusive; outside screw and yoke pattern in sizes 2 to 12 in., inclusive; screwed or flanged ends.

Also furnished with Jenkins type disc in same types, patterns and sizes as above.

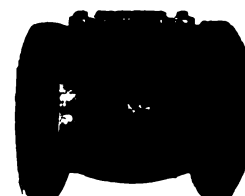


STANDARD IRON BODY
GLOBE VALVE

MH

TRADE-MARK

Check Valves—For steam working pressures up to 125 lbs. and water working pressures up to 175 lbs. Furnished in horizontal, angle and vertical patterns, screwed or flanged ends. Horizontal and angle patterns furnished with bolted caps (brass trimmed) in sizes 2 to 12 in., or with screwed caps (brass mounted) in sizes 1 to 3 in., inclusive. Vertical check valves furnished brass trimmed in sizes 2 to 12 in., inclusive.



STANDARD IRON BODY
HORIZONTAL CHECK
VALVE



STANDARD IRON BODY
SWING CHECK VALVE

Swing Check Valves—For same pressures and size as check valves, have bolted caps and brass trimmings.

Gate Valves—Our Standard iron body gate valves are designed for steam working pressures up to 125 lbs. and water working pressures up to 175 lbs. and are made in three types—Patented improved double disc, parallel seat; solid wedge; split wedge; in sizes 2 to 14 in., inclusive. The valves can be packed under pressure when wide open. Thickness and diameter of flanges conform to the American standard adopted January 1st, 1915.

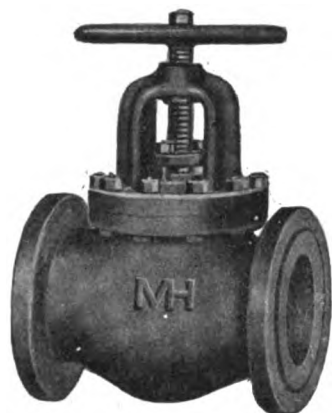


STANDARD INSIDE
SCREW GATE
VALVE

For oil refinery work these valves are furnished with Aterite disc rings and seat rings. Aterite is a patented non-corrosive alloy possessing far greater wear resisting qualities than bronze or brass and is also proof against the corrosive action of sulphur and sulphurous compounds occurring in crude oil. Thousands of these valves are in use in oil refineries and giving perfect satisfaction.



STANDARD OUTSIDE
SCREW AND YOKE
GATE VALVE

Medium Iron Body Valves

MEDIUM IRON BODY GLOBE VALVE

form to the American extra heavy standard, effective January 1, 1915.

Furnished in outside screw and yoke pattern, brass trimmed, screw or flanged ends, in sizes 2 to 12 in., inclusive. Valves 6 in. and larger furnished with by-pass at special price.

Gate Valves—For steam working pressures up to 175 lbs. and water working pressures up to 250 lbs.



MEDIUM IRON BODY OUTSIDE SCREW AND YOKE GATE VALVE

Extra Heavy Iron Body Valves

Globe, Angle and Cross Valves—For steam working pressures up to 250 lbs. and water working pressures up to 300 lbs. Very heavy and substantial in construction. May be packed under pressure when wide open.

Furnished in outside screw and yoke pattern, brass trimmed, screwed or flanged ends, in sizes 2 to 12 in., inclusive. Valves 6 in. and

Globe, Angle and Cross Valves—For steam working pressures up to 175 lbs. and water working pressures up to 250 lbs. Suitable for use as throttle valves and show a marked improvement over the old type of throttle valve. Disc and seat rings made of hard metal. Valves may be packed under pressure when wide open.

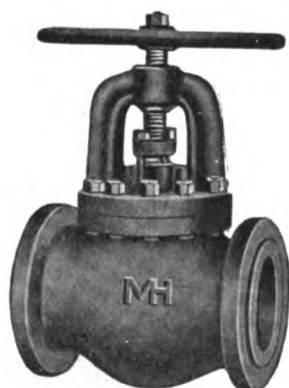
Diameter of flanges, thickness, bolt circle, size and number of bolts con-



MEDIUM IRON BODY INSIDE SCREW GATE VALVE

Made in three types—Patented improved double disc, parallel seat; solid wedge; split wedge; in sizes 2 to 14 in., inclusive; in non-rising stem and outside screw and yoke patterns; screwed or flanged ends. Flanged valves regularly furnished with a $\frac{1}{8}$ -in. raised face inside the bolt holes. Dimensions of flanges conform to the American extra heavy standard.

Other features of construction are similar to those mentioned in the description of standard iron body gate valves.



EXTRA HEAVY IRON BODY GLOBE VALVE

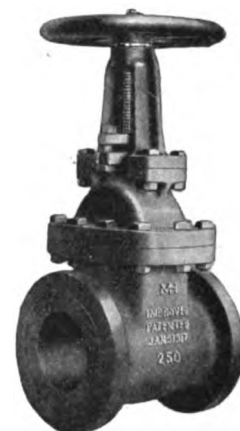


EXTRA HEAVY IRON BODY INSIDE SCREW GATE VALVE

of standard iron body check valves.

Gate Valves—For steam working pressures up to 250 lbs. and water working pressures up to 300 lbs.

Types, patterns, sizes and features of construction are similar to those mentioned in the description of standard iron body gate valves.



EXTRA HEAVY IRON BODY OUTSIDE SCREW AND YOKE GATE VALVE

Standard Iron Body Expansion Joint

For steam working pressures up to 125 lbs. Made flanged or screwed, with brass sleeve. Made with standard traverse, flanged, in sizes of from 2 to 16 in. with traverse of from $2\frac{1}{2}$ to 10 in.; standard traverse, screwed, in sizes of from 2 to 12 in. with traverse of

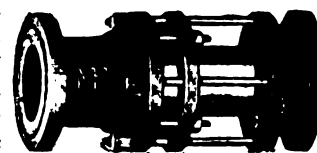


STANDARD IRON BODY EXPANSION JOINT

from $2\frac{1}{2}$ to 8 in.; special traverse, flanged or screwed, in sizes of from $2\frac{1}{2}$ to 8 in. with traverse of from 6 to 12 in. Stuffing boxes of expansion joints are not packed unless so ordered.

Extra Heavy Iron Body Expansion Joint

For steam working pressures up to 250 lbs. Made with tie rods and brass sleeve. Made in sizes of from 2 to 12 in. with standard traverse, screwed or flanged. Extra heavy expansion joints with special traverse made to order. Stuffing boxes are not packed unless so ordered.



EXTRA HEAVY IRON BODY EXPANSION JOINT

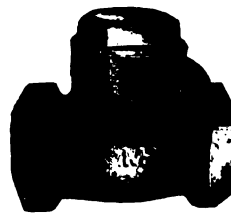
Brass Valves

McNab & Harlin brass valves are designed to meet the most rigid requirements for their various recommended pressures. All parts are interchangeable, facilitating renewals. Valves may be packed under pressure when wide open.

Globe, Angle and Cross Valves—Made with brass disc for 125, 175 and 250 lbs. steam working pressures; Jenkins type disc for 150 lbs. steam working pressure; re-grinding for 200 and 300 lbs. steam working pressures.



STANDARD BRASS
GLOBE VALVE



STANDARD BRASS
SWING CHECK VALVE



REGRINDING BRASS SWING
CHECK VALVE

Gate Valves—Valves for 125 lbs. steam working pressure furnished in parallel seat, solid wedge and split wedge types.

For 175 and 250 lbs. steam working pressure we can furnish valves of the double disc parallel seat type in either inside screw or outside screw and yoke pattern.



REGRINDING BRASS
GLOBE VALVE



JENKINS TYPE DISC
BRASS GLOBE VALVE



STANDARD BRASS
GATE VALVE

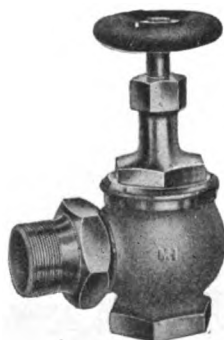


STANDARD BRASS
GATE VALVE

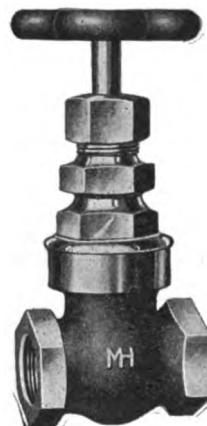
Radiator Valves—Jenkins type disc, with and without union connection, for pressures up to 150 lbs. when required.



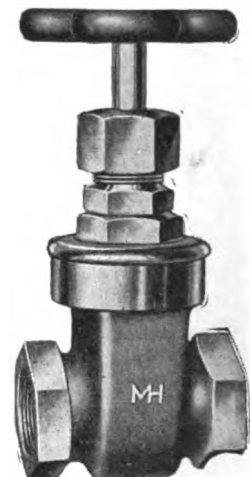
JENKINS TYPE
DISC BRASS
RADIATOR VALVE



JENKINS TYPE DISC
BRASS RADIATOR
VALVE WITH UNION



MEDIUM BRASS
GATE VALVE



EXTRA HEAVY BRASS
GATE VALVE

Check Valves—Horizontal, angle and swing check with brass disc, for 125, 175 and 250 lbs. steam working pressure; horizontal and angle check valves with Jenkins type disc for 150 lbs. steam working pressure; regrinding horizontal, angle and swing check valves for 200 and 300 lbs. steam working pressures.



STANDARD HORIZONTAL
BRASS
CHECK VALVE



REGRINDING BRASS
CHECK VALVE



STANDARD IRON
COCK

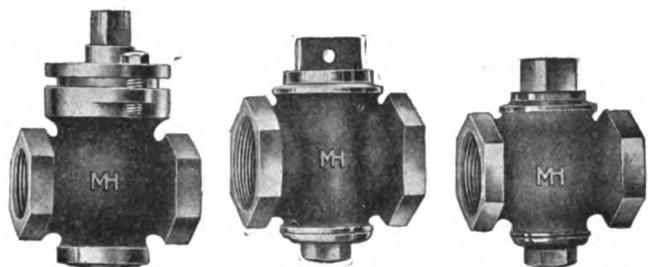


EXTRA HEAVY IRON
COCK

Iron and Brass Cocks

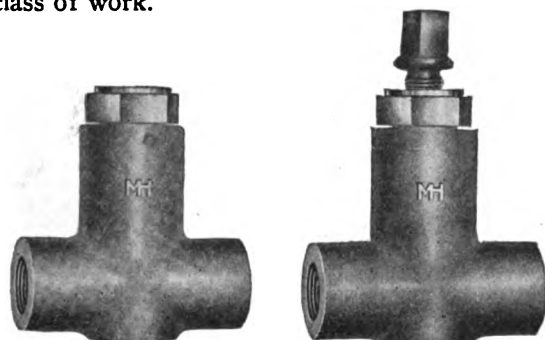
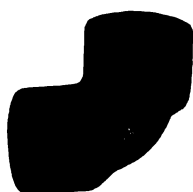
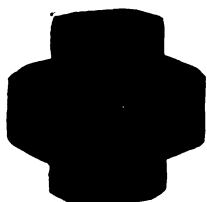
McNab & Harlin line of iron and brass cocks for steam, water and gas comprises a great number of styles

and sizes for all classes of service. Furnished in standard and extra heavy patterns with rectangular or roundway ports.

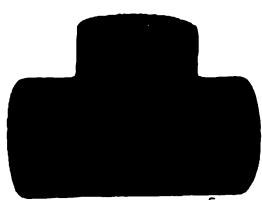
BRASS PACKED
PLUG COCKBRASS SERVICE
COCKSTANDARD BRASS
STEAM COCK

Hydraulic Valves and Fittings

For hydrostatic pressures ranging from 1000 to 10,000 lbs. per sq. in. Designed with a very high factor of safety. Composition used is a special hydraulic bronze having high tensile strength and especially suitable for this class of work.

HYDRAULIC CHECK
VALVEHYDRAULIC STOP
VALVEHYDRAULIC
ELBOW

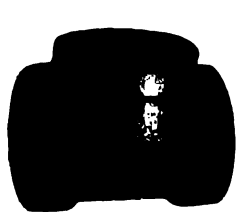
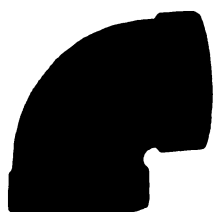
HYDRAULIC UNION



HYDRAULIC TEE

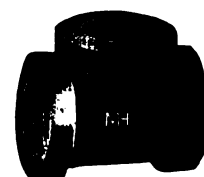
Oil Line Fittings

Cast iron fittings for oil lines are made for working pressures up to 250 lbs. Semi-steel fittings are made for working pressures up to 800 lbs.

CAST IRON TEE FOR
OIL LINESEMI-STEEL ELBOW FOR
OIL LINE

Cast Iron Screwed Pipe Fittings

McNab & Harlin line of cast iron standard, medium and extra heavy screwed fittings is complete for 125, 175 and 250 lbs. steam working pressures. All fittings tapped to Briggs standard gauge. The 175-lb. fittings are especially suitable for oil lines and car heating.

CAST IRON SCREWED
PIPE FITTING

Flanged Pipe Fittings

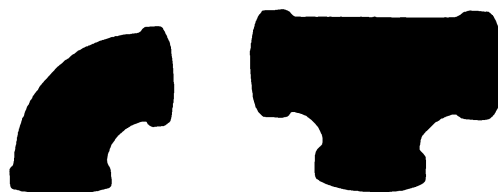
We have a full line of patterns and up-to-date equipment for the manufacture of standard and extra heavy flanged pipe fittings for 125 and 250 lbs. steam working pressure, also special patterns for reducing sizes and special shapes used extensively on power plant work. Dimensions and drilling conform with the American Standard adopted January 1, 1915.



FLANGED PIPE FITTINGS

Cast Iron Long Sweep Water and Sprinkler Fittings

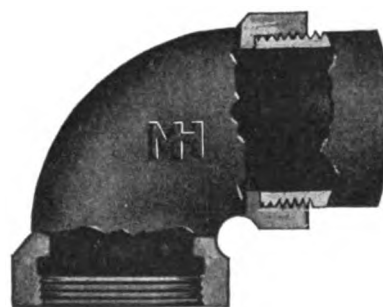
Well proportioned and designed to withstand greater strains of expansion, contraction, weight of pipe lines and water hammer than regular fittings. Radius is more than double those of ordinary fittings, complying with standard sprinkler specifications and general water work practice, resulting in minimum frictional resistance to flow. Furnished galvanized, when desired. Threaded to Briggs standard gauge.



CAST IRON LONG SWEEP WATER AND SPRINKLER FITTINGS

Drainage Fittings

We have a full line of patterns for regular or special drainage fittings. Well proportioned with sufficient sweep to give an unobstructed flow. Furnished galvanized, asphalt or oil dipped when desired.



DRAINAGE FITTING

NELSON VALVE COMPANY

Manufacturers of Valves for Power Plant and General Industrial Service
CHESTNUT HILL, PHILADELPHIA, PA.

BRANCH SALES OFFICES

ATLANTA, GA. (Southern Territory), 1311 Healey Building
BALTIMORE, MD., 8 East Lombard Street
BOSTON, MASS., 131 State Street
BUFFALO, N. Y., 582 Ellicott Square
CHICAGO, ILL. (Branch Store), 650 West Lake Street
CLEVELAND, OHIO, 550 Kirby Building
DETROIT, MICH. (Branch Store), 242-4 Larned Street, West

LONDON, ENG., 104 High Holborn, W. C. I.
LOS ANGELES, CAL., 228 Central Avenue
NEW YORK, N. Y., 90 West Street
PITTSBURGH, PA., 517 Liberty Avenue
SAN FRANCISCO, CAL., 75 Fremont Street
SCRANTON, PA., Wyoming Avenue, corner Gibson Street
SYRACUSE, N. Y., 504 City Bank Building

Products

NELSON VALVES: Gate, Globe, Angle, Cross Swing-check, Stop-check, Non-return, Seatless Blow-off, Quick Opening Blow-off.

Also manufacturers of Expansion Joints: brass and iron, for all pressures.

Scope

These valves are made for standard, medium and extra heavy pressures, for saturated and superheated steam, water, air, oil and special service.

There is a Nelson valve for almost every purpose, ranging in sizes from $\frac{1}{8}$ in. to 42 in. The valves illustrated on these pages are a few representative types.

A catalogue of the complete Nelson line will be sent on request.

Nelson Quality

An exceptionally high quality standard is maintained for Nelson valves. Materials are carefully selected, workmanship is of the skilled character produced by ideal shop conditions, and inspection and test are thorough.

As a result, 27 years' service of Nelson valves has firmly established them in the confidence and favor of engineers and valve users generally. Nelson valves are a *safe valve investment*.

Special Nelson Features

Nelson valves are designed in accordance with the most advanced and approved engineering practice. They are of heavy construction, with metal distributed to give maximum strength and service. Their lines are carefully determined for clear openings and smooth flow. Each valve must stand test pressures two or three times its rated working pressure.

Nelson bronze valves have liberal weight of metal wherever strength is required. Screwed end valves have wide hexes and taper threads. All bronze valves

are fitted with the new Nelson non-heating hand wheel.

An important feature of Nelson gate valves is the double disc mechanism. This provides a simple flexible gate, insuring easy travel and perfect seating in spite of presence of dirt or possible distortion of valve body. The discs travel freely to their lowest point and then spread into position, eliminating scraping or scoring of seats.

Nelson Bronze Valves

Gates—Nelson bronze gate valves include standard, medium and extra heavy patterns, screwed and flanged ends. They embody the Nelson double disc principle, insuring a tight valve under any line conditions.

Stems are tough manganese bronze, with generous acme threads. Medium and extra heavy valves are gland packed.

All valves have non-heating hand wheel.

In addition to regular inside screw valves, there are quick opening and rising stem types with bronze or monel mountings.

Globes—Nelson bronze globe and angle valves are made in both screwed and union bonnet patterns, screwed and flanged ends. They may be fitted with regrinding or *Nelsonite* renewable composition discs, both interchangeable on the same stem. They have tapered seats to prevent scoring. Stems are tough manganese bronze.

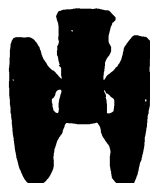
All valves have non-heating hand wheel.

Checks—Nelson bronze check valves include standard swing checks with regrinding or leather discs; extra heavy regrinding swing checks; horizontal globe and angle type cup checks and vertical check valves.



Section

Discs travel freely, steadied by guides, and enter and leave seats without scraping or chattering. Stem makes a "pack when open" joint when up



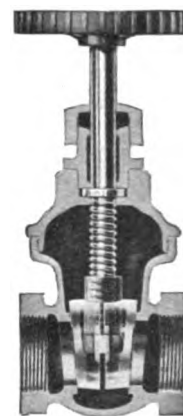
Parts

Only 3 parts—2 discs and 1 central wedge. Discs rock into position on the seats automatically, insuring perfect closing



Disc Ring
Disc ring rolled into disc under hydraulic pressure, forming tongue and groove joint which can not be loosened

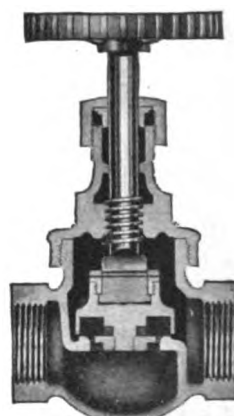
SPECIAL FEATURES OF NELSON VALVES



No. 101

STANDARD BRONZE GATE VALVE

Inside screw, screwed ends



No. 3

MEDIUM BRONZE GLOBE VALVE

Screwed ends, regrinding or hard rubber disc



No. 85

STANDARD BRONZE SWING CHECK VALVE, LEATHER DISC

Screwed ends, regrinding or leather disc

Nelson Iron Body Valves

Gates—The Nelson iron gate line offers a valve for practically every condition.

There are standard, medium and extra heavy patterns, with inside screw and outside screw and yoke types in each weight, and with screwed and flanged ends.

Large, medium and extra heavy valves are also furnished with by-passes.

In addition to these regular types, there are quick opening types, hub end valves; motor, chain wheel and hydraulically operated gates.

Nelson gate valves are mounted with screwed-in bronze seat rings and rolled-in bronze rings on the discs. The double disc and wedge construction insures positive closing and long satisfactory service. Medium and extra heavy valves have raised faces on end flanges.

Nelson gate valves may be ordered all-iron trimmed for acid and similar service.

Globes—Nelson iron globe and angle valves include standard, medium and extra heavy patterns.

The standard valves may be fitted with either regrinding or *Nelsonite* renewable composition discs, interchangeable on the same stem. The bonnets have through bolts.

Extra heavy Nelson globe valves are made with either cast yoke or Navy type yoke.

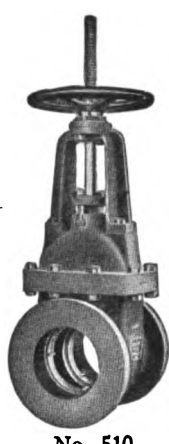
Checks—Nelson iron body check valves include swing checks in standard and extra heavy pressures, and extra heavy globe and angle cushioned check valves.

The standard swing check valve may be equipped with a leather disc or bronze regrinding disc.

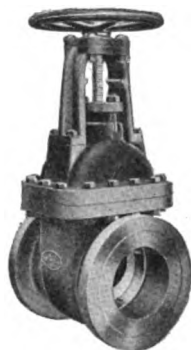
Nelson-Erwood — The Nelson-Erwood valve is a combination swing check and gate valve. The swing check disc is contained within the gate and is



No. 501
STANDARD
IRON BODY GATE
VALVE
Inside screw, bronze
mounted, screwed
ends



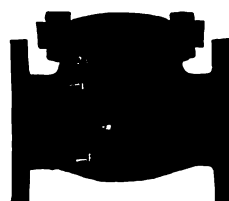
No. 510
STANDARD
IRON BODY
GATE VALVE
Outside screw
and yoke, bronze
mounted, flanged
ends



No. 530
EXTRA HEAVY IRON
BODY GATE VALVE
Outside screw and yoke,
bronze mounted, flanged ends



No. 602
STANDARD IRON
BODY GLOBE VALVE
Bronze mounted, flanged
ends



No. 704
STANDARD IRON
BODY SWING CHECK
VALVE
Bronze mounted, flanged
ends

adjustable for back pressure up to 5 lbs.

They have numerous applications on exhaust and discharge lines.

Nelson Steel Valves

Gates—Nelson steel gate valves represent the highest standard in steel valve construction. Close grained annealed castings of exceptionally heavy section are used in their manufacture and the trimmings are of monel metal throughout, adapting them to pressures of 350 lbs. and temperatures of 800°.

Various specifications are supplied for different temperatures and working conditions.

They have extra heavy bonnet and stuffing box, with a long condensing chamber and test cock for packing under pressure. Swing bolts are used on the stuffing box. Cork grips are provided on the hand wheel. Motor operation is frequently furnished on the larger sizes.

Globes—Nelson steel globe and angle valves are of heavy construction, monel mounted for superheated steam or composition mounted for other conditions.

They are built with either cast yokes or Navy type yokes. They can be repacked when open and under pressure. Shelves are provided on yoke for holding the gland.

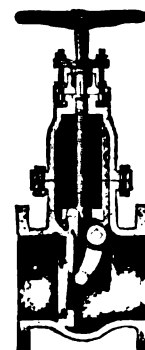
Non-returns—Nelson steel cushioned non-return stop and check valves are noted for their simplicity of construction.

The disc is cast in one piece of monel or nickel bronze, thereby avoiding the danger of parts shaking loose and becoming inoperative. The dashpot is cast on the bonnet and the disc guide insures accurate seating.

Success of Nelson Valves

Nelson valves are giving successful service in the best known power plants throughout the country, and are specified by leading engineers. They are a safe investment where first quality work is desired.

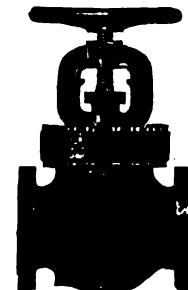
Reference book of Nelson valves giving details, specifications and dimensions will be mailed on request.



No. 708
NELSON-ERWOOD
SWING GATE VALVE
Iron body, bronze
mounted, flanged ends



No. 1554
EXTRA HEAVY CAST
STEEL GLOBE VALVE
With by-pass, outside
screw and yoke, monel
mounted



No. 1300
EXTRA HEAVY
CAST STEEL GLOBE
VALVE
Monel or composition
mounted



No. 1370
EXTRA HEAVY CAST
STEEL NON-RETURN
STOP AND CHECK
VALVE
Monel or composition
mounted

PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO.

26th Street and Allegheny Valley R. R.

P. O. Box 1016

PITTSBURGH, PA.

BRANCH OFFICES

NEW YORK, N. Y., 30 Church Street
CHICAGO, ILL., 650 McCormick Building

PHILADELPHIA, PA., 1323 Widener Building
CLEVELAND, OHIO, 1250 Rockefeller Building
BOSTON, MASS., 19 Milk Street

AGENTS

BIRMINGHAM, ALA., YOUNG & VANN SUPPLY CO., 1809 First Avenue
DENVER, COLO., MOUNTAIN STATES MACHINERY CO.

SAN FRANCISCO, CAL., E. A. KEITHLEY, Rialto Building
DETROIT, MICH., DETROIT POWER PIPING CO., 82 Griswold Street
TORONTO, CANADA, M. A. CAMPBELL, 32 Albany Street

Products

VALVES: Accumulator, Aiken Hydraulic Operating, Aiken Stop, Atmospheric Relief, Back Pressure, Blow-off, Butterfly, Check, Chronometer, Crichtlow Hydraulic Operating, Exhaust Relief, Float, Foot, Gate, Globe, Angle and Cross, Hydraulic, Non-return, Plug, Register, Relief, Shock, Stuart Hydraulic Operating, Tanner Hydraulic Operating, Throttle, and Transfer, for high and low pressures, in all sizes, for all services.

Specialists in **HYDRAULIC PIPING** and **OPERATING VALVES**, and in **PIPING SYSTEMS** for high pressure superheated steam. **PIPE, PIPE BENDS, PIPE FITTINGS** and **PIPING SUPPLIES**.

STEAM SEPARATORS.

Also **Valve Fittings and Appliances; Expansion Joints, Swivel Joints, Exhaust Heads, Cocks and Drip Pockets.**

Services

Complete piping contracts executed, designed by experienced engineers, manufactured by skilled workmen under competent supervision, and erected by expert fitters.

The engineering department makes a specialty of unusual conditions and is prepared to design or estimate any piping layout or special valves on receipt of specifications.



Engineers are invited to submit their piping and valve problems and a satisfactory solution is assured.

Standard Specifications

Our standard specifications have been adopted by the leading high pressure concerns in the United States, a copy of which will be furnished on request.

Guarantee

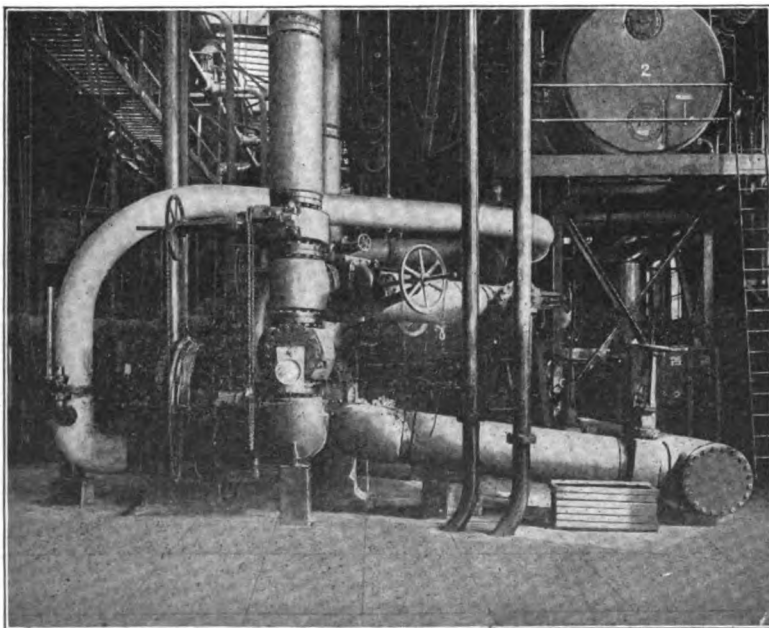
Our trade-mark is on all goods made by us, and we believe in maintaining its reputation. We fully guarantee our goods for the service sold.

Carefully conducted destruction tests of valves and fittings up to 36 in. have been made, and the data secured is an invaluable aid in making new designs.

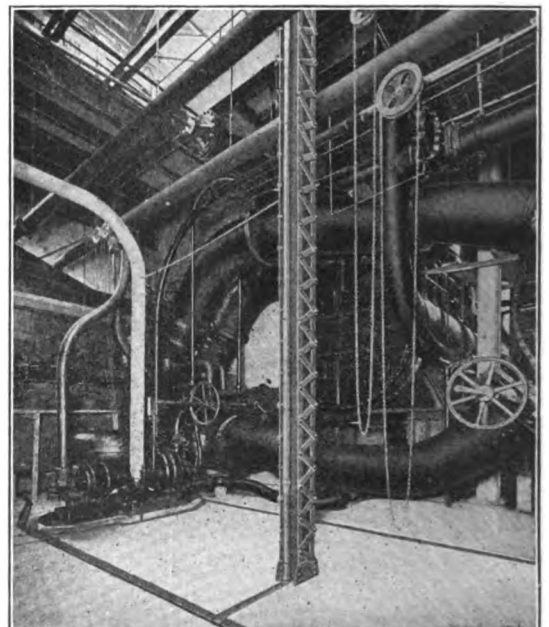
Gate Valves

Made in parallel and taper seat types. For exhaust, water, air and gas, the parallel seat type is recommended; while for medium and high pressure steam and hydraulic service, the taper seat type is recommended.

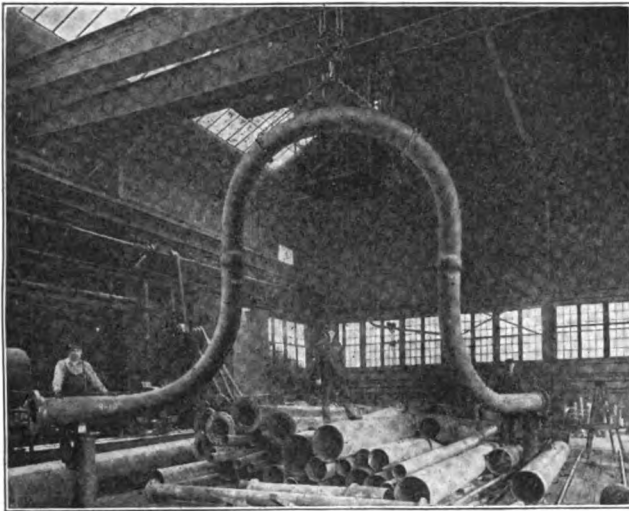
All types and sizes made either outside screw and yoke, or inside screw. Patterns are so arranged that valves can be made all iron or with bronze, monel or special mountings.



MISCELLANEOUS PIPING



CONDENSER PIPING



PIPE BEND

Contains 53 ft. of 14-in. pipe. The three lengths were connected by the Atwood line weld. On account of its size, it could not be shipped by rail. A river barge was used to deliver it to the Aliquippa plant of the Jones & Laughlin Steel Co.

Motor Operated Gate Valves—We have applied motor drives to gates for various classes of work, using either direct or alternating current. Gearing for our motor operated gate valve is designed to meet the requirements of strength and compactness. All gear teeth are cut.

Cylinder Operated Gate Valves—Built for any pressure or service. Motive fluid may be water, air or steam. If the fluid is gaseous, as steam or air, placing the cylinder in a horizontal position is recommended. If, however, a vertical position can not be avoided, special attachments to meet conditions will be furnished.

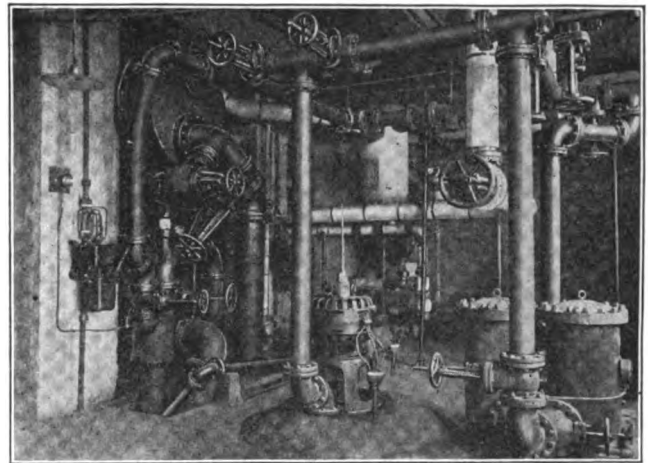
Stuart Two-pressure Operating Valves

Used extensively by the largest rubber manufacturers for operating heaters and presses with high and low pressure water.

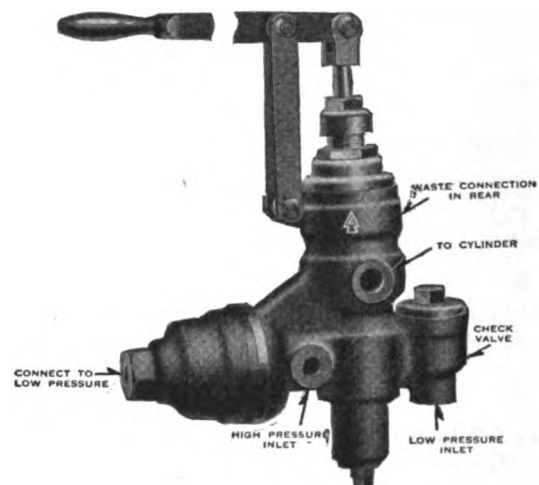
Supply of high pressure water is controlled automatically, and can not be turned on at the wrong time, nor can either the high or low pressure be turned into the waste.

Operation is very simple. Moving lever up or down will raise or lower the press, using low pressure water only. When moulds come against the head of heater, or top of press, high pressure water is automatically turned on to squeeze moulds and low pressure is automatically cut off. After curing process is complete, lever is pulled as far as possible, which shuts off high pressure water and waste water in press.

This valve saves high pressure water; increases output; is foolproof; saves money and annoyance.



MISCELLANEOUS PIPING AT CLEVELAND POWER PLANT OF PENNSYLVANIA LINES WEST OF PITTSBURGH



STUART TWO-PRESSURE OPERATING VALVE

$\frac{3}{4}$ -in. high pressure; 2-in. low pressure; 2½ in. to cylinder; 2½-in. waste. Lever furnished if so ordered

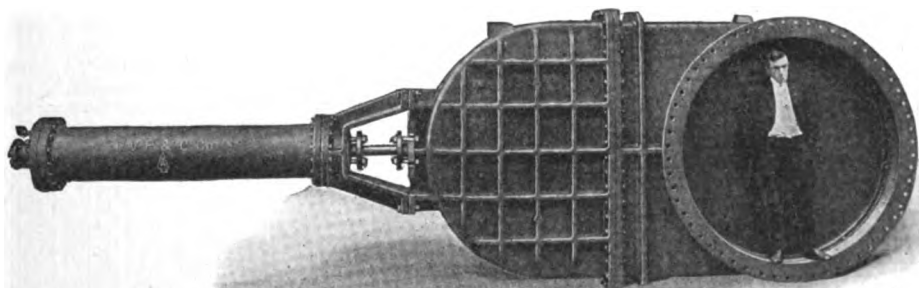
Steam Separators

In these separators, every condition for good separation is met.

The standard horizontal, vertical and angle separators are made with cast iron bodies and wells.

Receiver type separators are made of semisteel bodies and wrought steel wells. They are constructed upon the same general principles as the smaller separators.

The welded receiver type separators have necks welded in by the "interlock" method. This type is guaranteed to be absolutely tight and has proved its reliability under the most severe service.



72-INCH CYLINDER OPERATED GATE VALVE

THE WM. POWELL CO.

Manufacturers of Valves and Dependable Steam Engineering Specialties
CINCINNATI, OHIO

Products

POWELL VALVES: including, Globe, Angle, Cross, Check, Gate, Needle, Radiator, Y, Blow-off, Automatic Non-return, Safety Triple Acting Non-return and Throttle Valves of bronze, iron, steel, monel metal, and acid resisting compositions for steam, water, oil, air, gas, and chemical solutions.

POWELL LUBRICATORS for steam, gasoline, oil, gas and compressor engines and bearings, in Sight Feed, Manual and Mechanical Force Feed and Gravity Feed. Also manufacturers of Powell Grease Cups, Brass and Glass Oil Cups; Priming Cups, Gasoline Strainers; Generator Valves, Cocks, Unions and Fittings.

Experience

THE WM. POWELL CO. is one of the oldest manufacturers of valves and engineering specialties, being established in 1846. Originators of the "regrinding" valve and the renewable hard metal disc and seat valve, and snap lever oil cups. This company has given to the trade many originalities, since adopted as universal standards by many other manufacturers.

Bronze "White Star" Globe, Angle, Cross and Check Valves

Regrinding, renewable seats and renewable discs. The seats and discs of these valves are made of "Powellium Nickel," a long wearing, non-corrosive hard white metal, insuring added life to the wearing parts of the valve. When the seat is worn out it can be renewed at minimum expense. The disc has two faces which are reversible giving it a double life. These features render unnecessary the purchase of a new valve when the seat or disc is worn out.

These valves are furnished for working steam pressures of 200 or the extra heavy for 300 lbs.

They may be had with outside screw yoke or with bolted yoke.

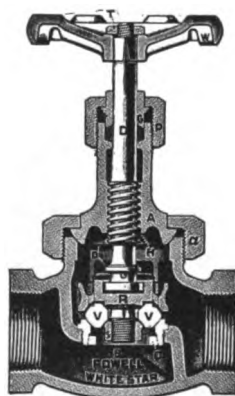


FIG. 12. "WHITE STAR" VALVE

NOS. 12 TO 17 VALVES
Dimensions and measurements in inches

Size of valve.....	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3
Face to face, flange ends, globe.....	3	3	$3\frac{1}{2}$	4	$4\frac{1}{2}$	5	6	$7\frac{1}{4}$	8	9	
Center to face, flange ends, angle.....	$1\frac{1}{8}$	$1\frac{1}{8}$	2	$2\frac{1}{4}$	$2\frac{3}{8}$	$2\frac{7}{8}$	$3\frac{1}{8}$	$3\frac{3}{8}$	$4\frac{1}{4}$	$4\frac{1}{2}$	
Diameter of flanges.....	$2\frac{1}{2}$	$2\frac{1}{2}$	3	$3\frac{1}{2}$	4	$4\frac{1}{2}$	5	6	7	$7\frac{1}{2}$	
Thickness of flanges.....	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	
Face to face, screw ends, globe.....	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{3}{4}$	$3\frac{1}{4}$	$3\frac{3}{4}$	$4\frac{1}{4}$	$4\frac{3}{4}$	$5\frac{1}{4}$	$6\frac{1}{4}$	$8\frac{1}{4}$	
Center to face, screw ends, angle.....	$1\frac{1}{8}$	$1\frac{1}{8}$	$1\frac{3}{8}$	$1\frac{3}{4}$	$1\frac{3}{4}$	$1\frac{7}{8}$	$2\frac{1}{8}$	$2\frac{1}{4}$	$2\frac{3}{4}$	$4\frac{1}{4}$	
Center to bottom of body.....	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	
Center to top of stem when open.....	$3\frac{1}{8}$	$3\frac{1}{8}$	$4\frac{1}{8}$	$5\frac{1}{8}$	$6\frac{1}{8}$	$7\frac{1}{8}$	$8\frac{1}{8}$	$9\frac{1}{8}$	$10\frac{1}{8}$	$11\frac{1}{8}$	
Center to top of stem when closed.....	$3\frac{1}{8}$	$3\frac{1}{8}$	$4\frac{1}{8}$	$5\frac{1}{8}$	$6\frac{1}{8}$	$7\frac{1}{8}$	$8\frac{1}{8}$	$9\frac{1}{8}$	$10\frac{1}{8}$	$11\frac{1}{8}$	
Diameter of stem.....	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	
Diameter of hand wheel.....	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{3}{4}$	3	$3\frac{1}{4}$	$3\frac{3}{4}$	$4\frac{1}{4}$	$4\frac{3}{4}$	$5\frac{1}{4}$	$6\frac{1}{4}$	

Bronze "Model Star" Regrinding Globe, Angle, Cross and Check Valves

These valves are cast of steam bronze composition for working pressures of 200 or 300 lbs. The disc is arranged to slide over the head of the stem into a socket, which permits it to swivel freely and does away with the old style lock nut. The disc is guided to its seat by means of ribs cast in the body shell. This construction makes for ease in regrinding or renewing.

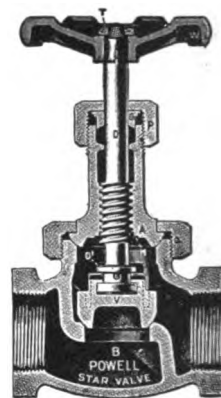


FIG. 110. "MODEL STAR" VALVE

NOS. 110 TO 115 VALVES
Dimensions and measurements in inches

Size of valve.....	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3
Face to face, flange ends, globe.....	3	$3\frac{1}{8}$	$3\frac{1}{2}$	4	$4\frac{1}{2}$	5	6	$7\frac{1}{4}$	8	$8\frac{1}{4}$	
Center to face, flange ends, angle.....	$1\frac{1}{8}$	$1\frac{1}{8}$	2	$2\frac{1}{4}$	$2\frac{3}{8}$	$2\frac{7}{8}$	$3\frac{1}{8}$	$3\frac{3}{8}$	$4\frac{1}{4}$	$4\frac{1}{2}$	
Diameter of flanges.....	$2\frac{1}{2}$	$2\frac{1}{2}$	3	$3\frac{1}{2}$	4	$4\frac{1}{2}$	5	6	7	$7\frac{1}{2}$	
Thickness of flanges.....	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	
Face to face, screw ends, globe.....	2	2	$2\frac{1}{4}$	$2\frac{3}{4}$	$3\frac{1}{4}$	$3\frac{3}{4}$	$4\frac{1}{4}$	$4\frac{3}{4}$	$5\frac{1}{4}$	$6\frac{1}{4}$	
Center to face, screw ends, angle.....	$1\frac{1}{8}$	$1\frac{1}{8}$	$1\frac{3}{8}$	$1\frac{3}{4}$	$1\frac{3}{4}$	$1\frac{7}{8}$	$2\frac{1}{8}$	$2\frac{1}{4}$	$2\frac{3}{4}$	$4\frac{1}{4}$	
Center to bottom of body.....	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	
Center to top of stem when open.....	$3\frac{1}{8}$	$3\frac{1}{8}$	$4\frac{1}{8}$	$5\frac{1}{8}$	$6\frac{1}{8}$	$7\frac{1}{8}$	$8\frac{1}{8}$	$9\frac{1}{8}$	$10\frac{1}{8}$	$11\frac{1}{8}$	
Center to top of stem when closed.....	$3\frac{1}{8}$	$3\frac{1}{8}$	$4\frac{1}{8}$	$5\frac{1}{8}$	$6\frac{1}{8}$	$7\frac{1}{8}$	$8\frac{1}{8}$	$9\frac{1}{8}$	$10\frac{1}{8}$	$11\frac{1}{8}$	
Diameter of stem.....	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	
Diameter of hand wheel.....	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{3}{4}$	3	$3\frac{1}{4}$	$3\frac{3}{4}$	$4\frac{1}{4}$	$4\frac{3}{4}$	$5\frac{1}{4}$	$6\frac{1}{4}$	

Bronze Union Composite Disc Globe, Angle, Cross, Check and Radiator Valves

Especially adapted for steam or hot water heating, having a vulcanized disc for working pressures up to 150 lbs. The body and bonnet construction is similar to our White Star valve, having a ground union joint connection.

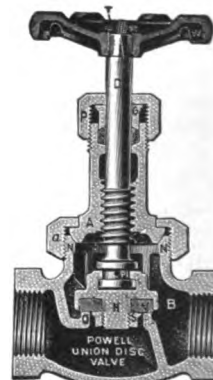


FIG. 150. VALVE

NOS. 150 TO 152 VALVES
Dimensions and measurements in inches

Size of valve.....	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3
Face to face, flange ends, globe.....	3	$3\frac{1}{8}$	$3\frac{1}{2}$	4	$4\frac{1}{2}$	5	6	$7\frac{1}{4}$	8	$8\frac{1}{4}$	
Center to face, flange ends, angle.....	$1\frac{1}{8}$	$1\frac{1}{8}$	2	$2\frac{1}{4}$	$2\frac{3}{8}$	$2\frac{7}{8}$	$3\frac{1}{8}$	$3\frac{3}{8}$	$4\frac{1}{4}$	$4\frac{1}{2}$	
Diameter of flanges.....	$2\frac{1}{2}$	$2\frac{1}{2}$	3	$3\frac{1}{2}$	4	$4\frac{1}{2}$	5	6	7	$7\frac{1}{2}$	
Thickness of flanges.....	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	
Face to face, screw ends, globe.....	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{3}{4}$	$3\frac{1}{4}$	$3\frac{3}{4}$	$4\frac{1}{4}$	$4\frac{3}{4}$	$5\frac{1}{4}$	$6\frac{1}{4}$	$8\frac{1}{4}$	
Center to face, screw ends, angle.....	$1\frac{1}{8}$	$1\frac{1}{8}$	$1\frac{3}{8}$	$1\frac{3}{4}$	$1\frac{3}{4}$	$1\frac{7}{8}$	$2\frac{1}{8}$	$2\frac{1}{4}$	$2\frac{3}{4}$	$4\frac{1}{4}$	
Center to bottom of body.....	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	
Center to top of stem when open.....	$3\frac{1}{8}$	$3\frac{1}{8}$	$4\frac{1}{8}$	$5\frac{1}{8}$	$6\frac{1}{8}$	$7\frac{1}{8}$	$8\frac{1}{8}$	$9\frac{1}{8}$	$10\frac{1}{8}$	$11\frac{1}{8}$	
Center to top of stem when closed.....	$3\frac{1}{8}$	$3\frac{1}{8}$	$4\frac{1}{8}$	$5\frac{1}{8}$	$6\frac{1}{8}$	$7\frac{1}{8}$	$8\frac{1}{8}$	$9\frac{1}{8}$	$10\frac{1}{8}$	$11\frac{1}{8}$	
Diameter of stem.....	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	
Diameter of hand wheel.....	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{3}{4}$	3	$3\frac{1}{4}$	$3\frac{3}{4}$	$4\frac{1}{4}$	$4\frac{3}{4}$	$5\frac{1}{4}$	$6\frac{1}{4}$	

Iron Body Bronze Mounted "Irene" Globe, Angle, Cross and Check Valves

This type of valve is made for 150 or 250 lbs. working pressure. The seat and disc are made of "Powellium Nickel," being regrindable and renewable. These valves can also be had with vulcanized discs and renewable seats.

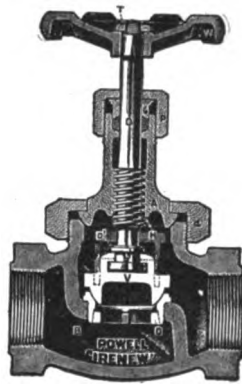


FIG. 190. "IRENEW" VALVE

NOS. 190 TO 195 VALVES
Dimensions and measurements in inches

Size of valve.....	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3
Face to face, flange ends, globe.....	4 1/2	5	5 1/2	6 1/4	8	8 1/2	9 1/2	10 1/2	11 1/2	12 1/2
Center to face, flange ends, angle.....	2 1/4	2 5/8	3	3 3/4	4 1/2	5	5 1/2	6 1/2	7 1/2	8 1/2
Diameter of flanges.....	3 1/2	4	4 1/2	5	6	7	7 1/2	8 1/2	9 1/2	10 1/2
Thickness of flanges.....	1 1/2	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
Face to face, screw ends, globe.....	2 1/4	2 5/8	3	3 3/4	4 1/2	5	5 1/2	6 1/2	7 1/2	8 1/2
Center to face, screw ends, angle.....	1 1/2	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
Center to bottom of body.....	3/4	1	1 1/4	1 1/2	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
Center to top of wheel when open.....	3 1/4	4 1/4	5	6 1/4	7 1/4	8 1/4	9 1/4	10 1/4	11 1/4	12 1/4
Center to top of wheel when closed.....	3 1/2	4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	9 1/2	10 1/2	11 1/2	12 1/2
Diameter of stem.....	5/16	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4
Diameter of hand wheel.....	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/2	4 3/4	5

Bronze "White Star" Gate Valves

The White Star gate valve like all Powell White Star valves, has a ground union joint at body and bonnet. Double discs of "Powellium Nickel," made with ball and socket back, are hung loosely on the stem. Being seated at an angle, the first motion in opening relieves the downward pressure on the discs. The discs can easily be removed and refaced. Constructed for 200 or 300 lbs. working pressure, and supplied when specified with removable, renewable "Powellium Nickel" seat rings, adding much longer service.

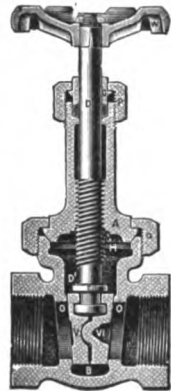


FIG. 375. "WHITE STAR" VALVE

NOS. 375 TO 376 VALVES
Dimensions and measurements in inches

Size of valve.....	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3
Face to face, flange ends.....	2 1/4	2 3/4	3	3 1/4	3 3/4	4 1/4	4 3/4	5 1/4
Diameter of flanges.....	2 1/2	2 3/4	3	3 1/4	3 3/4	4 1/4	4 3/4	5 1/4
Thickness of flanges.....	1 1/2	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
Face to face, screw ends.....	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
Center to bottom of body.....	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
Diameter of hand wheel.....	2 1/2	2 3/4	3	3 1/4	3 3/4	4 1/4	4 3/4	5 1/4
Center to top of stem when open.....	3 1/2	3 3/4	4	4 1/4	4 3/4	5 1/4	5 3/4	6 1/4
Center to top of stem when closed.....	3 1/2	3 3/4	4	4 1/4	4 3/4	5 1/4	5 3/4	6 1/4
Diameter of stem.....	5/16	1/4	3/8	1/2	5/8	3/4	7/8	1

Bronze or Iron Body, Bronze Mounted "Titan" Throttle Valves

These valves are furnished in bronze or iron body with bronze trimmings. The discs or gates are of bronze of the double wedge type which close tightly with very little force being exerted on the lever. This quick opening valve is for working pressures up to 175 lbs.

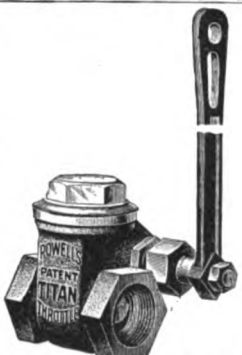


FIG. 350. TITAN VALVE

NO. 350 VALVE
Dimensions and measurements in inches

Size of valve.....	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3
Face to face.....	2 1/4	2 3/4	3	3 1/4	3 3/4	4 1/4	4 3/4	5 1/4
Height of valve.....	2 1/4	2 3/4	3	3 1/4	3 3/4	4 1/4	4 3/4	5 1/4
Width of valve body.....	2 1/4	2 3/4	3	3 1/4	3 3/4	4 1/4	4 3/4	5 1/4
Vertical center to center of stem.....	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
Center of port to center of stem.....	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
Center to end of stem.....	2 3/4	3	3 1/4	3 3/4	4 1/4	4 3/4	5 1/4	5 3/4
Radius of lever circle.....	5	6	7	8	9	10	11	12

Iron Body Bronze Mounted or All-iron Pilot Gate Valves

This gate valve has a strong compact iron body for working pressures up to 100 lbs. They have double wedge discs with rising stems and are made in sizes from 1/4 to 6 in. and with non-rising stems in sizes 3 1/2 to 6 in. This valve may also be had in the quick opening type, operated by a lever instead of the regular screw stem.



FIG. 460. PILOT VALVE

NOS. 460 TO 477 VALVES
Dimensions and measurements in inches

Size of valve.....	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4	5	6
Face to face, flange ends.....	3 1/4	4	4 1/2	5	5 1/2	6	7	7 1/2	8 1/2	9 1/2	10 1/2
Diameter of flanges.....	3 1/2	4	4 1/2	5	5 1/2	6	7	7 1/2	8 1/2	9 1/2	10 1/2
Thickness of flanges.....	1 1/2	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
Face to face, screw ends.....	2 1/4	2 3/4	3	3 1/4	3 3/4	4 1/4	4 3/4	5 1/4	5 3/4	6 1/4	6 3/4
Center to bottom of body.....	3/4	1	1 1/4	1 1/2	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
Diameter of hand wheel.....	2 1/2	2 3/4	3	3 1/4	3 3/4	4 1/4	4 3/4	5 1/4	5 3/4	6 1/4	6 3/4
Center to top of stem when open.....	5	5 1/2	6	6 1/2	6 3/4	7	7 1/2	7 3/4	8 1/2	8 3/4	9 1/2
Center to top of stem when closed.....	4 1/2	5	5 1/2	6	6 1/2	6 3/4	7	7 1/2	7 3/4	8 1/2	8 3/4
Diameter of stem.....	5/16	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 1/2
Fulcrum to end of lever fork when open.....	7 1/2	8 1/2	9 1/2	10	10 1/2	11 1/2	12 1/2	13 1/2	14 1/2	15 1/2	16 1/2
Center to top of lever fork when closed.....	5 1/2	6 1/2	7 1/2	8 1/2	9 1/2	10 1/2	11 1/2	12 1/2	13 1/2	14 1/2	15 1/2
Center to top of lever fork when closed.....	5 1/2	6 1/2	7 1/2	8 1/2	9 1/2	10 1/2	11 1/2	12 1/2	13 1/2	14 1/2	15 1/2
Center to edge of link.....	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4

Powell Patent "Signal" Oiler

The original "Lever Up, Lever Down," sight-feed oiler.

This is the original pattern. Imitations cannot reach it in quality. We warrant them absolutely faultless and satisfactory.

Feed can be instantly stopped or started without disturbing regulation. Milled nut R regulates the drop. Jam nut O securely locks it. Swinging lever S covers filling hole.



POWELL PATENT "SIGNAL" OILER
Fig. 774. Polished brass
Fig. 775. Nickelplated

Powell Trojan Lubricator

The same high plane of excellence is maintained in the Powell Trojan Sight Up-feed Lubricator.

A thoroughly efficient double connection lubricator of neat design, superior workmanship and finish.

The body shell is cast in one piece—a patented Powell construction. This insures positive feed and perfect lubrication under all conditions, as the arms cannot get out of line and there are no joints to loosen or leak.

We manufacture a complete line of lubricators, oilers and grease cups.



POWELL TROJAN LUBRICATOR

POWELL PATENT "SIGNAL" OILER

No.....	00	0	1	1 1/2	2	3	4	5	6	7	8
Outside diameter of glass, in.....	1 1/8	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/2	4
Height of glass, in.....	1 1/8	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/2	4
Capacity: Ounces.....	1/2	3/4	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5
Pints.....	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2
Shank, pipe thread, in.....	1/8	1/4	1/4	3/8	3/8	1/2	1/2	1/2	1/2	1/2	1/2

POWELL TROJAN LUBRICATOR

Capacity.....	1/2 pt.	1 pt.	1 1/2 pt.	2 pt.	3 pt.	4 pt.	5 pt.	6 pt.	7 pt.	8 pt.	9 pt.	10 pt.
Size of shank, in.....	1/8	1/4	1/4	3/8	3/8	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Index glass, in.....	1 1/8	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/2	4	4 1/2
Sight-feed glass, in.....	1 1/8	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/2	4	4 1/2

READING STEEL CASTING CO., INC.

READING VALVE and FITTINGS DIVISION
Manufacturers of Valves and Fittings

GENERAL SALES OFFICE
BRIDGEPORT, CONN.

DISTRICT SALES OFFICES

BOSTON, MASS.
CHICAGO, ILL.

HARTFORD, CONN.
DETROIT, MICH.

HOUSTON, TEX. SAN FRANCISCO, CAL.

NEW YORK, N. Y.
PITTSBURGH, PA.

PHILADELPHIA, PA.
CLEVELAND, OHIO

CHARLOTTE, N. C.

Products

ACID OPEN HEARTH CAST STEEL VALVES and FITTINGS for all temperatures and pressures.

For Bronze and Iron Valves and Cocks, see page opposite.

Reading Steel

The merits of the several methods and combinations of methods of steel making were carefully weighed by our engineers before it was decided to install acid open hearth furnaces to make the steel for Reading cast steel valves, fittings and flanges.

The open hearth process permits of taking frequent samples for analysis during the heat and of close control, resulting in uniformity of the steel, and the acid furnace yields a steel with a minimum of occluded gases, and, therefore, greatest freedom from gas bubbles and porosity.



FLANGED ELL



SCREWED CROSS

Experience

The Reading Foundry has, throughout its existence, been exclusively a steel casting plant and for several years has specialized on pressure castings. It was early discovered that the moulding practice is of primary importance in this class of work and intensive study has resulted in advanced methods, particularly to secure proper venting of the moulds and to make proper provision for shrinkage. Experience has also led us to thoroughly anneal every flange and fitting.

Application

Reading cast steel valves, fittings and flanges are essential for services involving high pressures and tem-

perature, not only because of their great strength, but more particularly because the perfect elasticity and reliability are unimpaired and the loss in strength is so small as to leave large factors of safety at the maximum working pressures specified.

These flanges, fittings and valves are designed for superheated steam services, pressure stills, and hydraulic or other installations involving high pressures, high temperature, shock, vibrations or other severe line strains.

PROPERTIES OF READING CAST STEEL FLANGES AND FITTINGS

Class	Type	Steam working pressure, lbs.	Cold water or oil working pressure, lbs.		Test pressure, lbs.
			No shock	With shock	
Standard	Flanged Screwed	250	500	250	1000
Medium	Flanged	250	500	250	1000
Extra heavy	Flanged Screwed	350 350	600 1200 to 1500	350 400	1200 1800 to 2250
800 lb. Hydraulic	Flanged	...	800	500	1200
1200 lb. Hydraulic	Flanged	...	1200	800	1800
3000 lb. Hydraulic	Flanged Screwed	...	3000	2000	4500
6000 lb. Hydraulic	Screwed	...	6000	4500	9000

Standard cast steel fittings are made on the same patterns as standard cast iron fittings, but are good for all the services of extra heavy cast iron.

Medium cast steel fittings have the same metal wall and flange thicknesses as the standard, but the face to face flange diameter and bolting are the same as extra heavy cast iron fittings. They are designed for replacement of extra heavy cast iron fittings.

The fittings are all good for the steam pressures specified for temperatures up to 800° Fahr. and for these pressures in hot oil or other liquids or gases.

Reading Steel Valves

Cast steel gate valves, globe and angle valves, check valves and stop and check valves are made for saturated steam service up to 250 lbs. pressure, and for superheated steam service up to 350 lbs. pressure, and for a total temperature up to 800° Fahr. The 350-lb. steam pressure valves are for 800 lbs. cold water or oil pressure and we also make hydraulic valves for 1500 lbs. and 3000 lbs. working pressure.



SCREWED RETURN BEND



FLANGED NOZZLE



45° ELBOW



SCREWED ELBOW

READING STEEL CASTING CO., INC.

PRATT and CADY DIVISION

Manufacturers of Valves and Asbestos Packed Cocks

GENERAL SALES OFFICE
BRIDGEPORT, CONN.

Products

BRONZE and IRON VALVES for all services.

For Cast Steel Valves and Fittings, see page opposite.

Bronze Globe and Angle Valves

Renewable Disc Type—Made in sizes $\frac{1}{8}$ to 3 in. inclusive, in two weights, suitable for 150 and 250 lbs. steam pressure, respectively. Both weights are made with screwed hubs and the 150-lb. lines have the well-known P&C renewable asbestos disc; the 250-lb. line has a renewable solid bronze disc and renewable seat ring.



BRONZE GLOBE VALVE, RE-GRINDING TYPE

Regrinding Type—Made in sizes $\frac{1}{8}$ to 3 in. inclusive, in three weights, suitable for 200, 250, and 300 lbs. steam pressure, respectively.

These valves are of the union bonnet type, and carry certain special features which make them particularly suitable for severe service. The 300-lb. line can be equipped with renewable seat rings when so ordered.

Iron Body Globe and Angle Valves

Made in two styles, one with renewable asbestos disc for 150 lbs. steam; and the other with 45° seat, in two weights, 150 and 250 lbs. steam pressure, respectively.

The renewable asbestos disc type is made in sizes 2 to 14 in. inclusive.

The 45° seat valves are made in sizes 2 to 10 in. inclusive.

These valves are all built with renewable seat rings, can be packed under pressure and all parts renewed without taking the valve from the pipe line.



IRON BODY GLOBE VALVE, FLANGED TYPE

Bronze Gate Valves

Made in all sizes and in five weights, suitable for 125, 150, 175, and 250 lbs. steam pressure, and 800 lbs. water pressure, respectively. The 150-, 250- and 800-lb. lines have renewable seat rings which can be changed without removing the valve from the line.

All P&C gate valves are equipped with double faced bronze wedges which permit the pressure to be applied on either side and are reversible.

Iron Body Water Gate Valves

Sizes 3 to 24 in. inclusive, for 125 to 150 lbs. water working pressures; 14 to 36 in. inclusive, for 75 to 100 lbs. working pressure; 10 to 36 in. inclusive, for 35 to 75 lbs. working pressures. We also make high pressure hydraulic valves for 800 and 1500 lbs. working pressure in sizes $1\frac{1}{2}$ to 8 in. These valves are bronze trimmed. In opening, one turn of the spindle releases the wedge in the gate, allowing the valve to open freely without friction. Furnished with inside screw or outside screw and yoke.



WATER GATE VALVE, HUB END TYPE

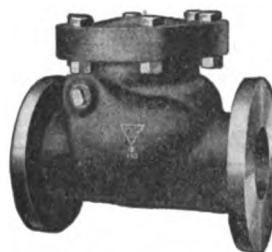
Swing Check Valves, Bronze and Iron

Bronze swing check valves made in sizes $\frac{1}{8}$ to 3 in. inclusive, for all pressures and purposes.

Iron body swing check valves made in sizes 2 to 24 in. inclusive; for 150 lbs. water. Sizes 3 to 12 in. inclusive, conform to Fire Underwriters' specifications.

We also make a line suitable for 300 lbs. water in sizes 2 to 12 in. inclusive. Working parts for any of these valves can be renewed or the disc reground without removing the valve from the line. The only tools necessary for regrounding are a wrench and brace and bit.

Made in screwed, flanged or bell ends.



SWING CHECK VALVE, FLANGED TYPE

Iron Body Gate Valves

Made in sizes 2 to 16 in. inclusive, for 125, 150, and 200 lbs. steam working pressures. The 125-lb. line will be furnished built to Underwriter specifications if desired. All the valves are bronze trimmed and have bronze faced solid wedges except the 125-lb. valves which can be furnished with a new design of split wedge, so made as to have the advantages, but not the disadvantages, usual to a split wedge. These valves are made in the inside screw, outside screw and yoke, and quick opening type, and with screwed, flanged or bell ends.



IRON BODY GATE VALVE, FLANGED TYPE

Asbestos Packed Cocks, Bronze and Iron

Bronze cocks in sizes $\frac{1}{4}$ to 4 in. inclusive, for 150 and 250 lbs. steam working pressures respectively.

Iron cocks in sizes $\frac{1}{4}$ to 4 in. inclusive, for 100 to 125, 150 to 200, and 250 lbs. steam working pressures, respectively. Also made in sizes up to 10 in. for the various pressures with worm gear operating attachment.

The dovetailed "U" shaped grooves in the body are packed with prepared asbestos and afterwards subjected to a special vulcanizing process. An asbestos ring is used on the shoulder of the plug for top packing. The plug is carefully finished and barfed to make it rustproof. It has no metallic bearing, coming in contact only with the asbestos which compensates for the differential expansion of the plug and body.

These cocks give excellent results as boiler blow-off valves and other severe services where other types of valves fail.



ASBESTOS PACKED COCK WITH WORM AND GEAR ATTACHMENT

BABBITT STEAM SPECIALTY COMPANY

Manufacturers of Adjustable Valve Operating Mechanism

NEW BEDFORD, MASS.

Products

BABBITT ADJUSTABLE SPROCKET RIM with CHAIN GUIDE (patented) for opening and closing overhead valves, sash, hoppers, etc.

RUS-GO, a Chemical Combination of Rust-eating, Non-acid Oils, for loosening nuts, bolts, joints, and for cleaning rust from metals.

Babbitt Adjustable Sprocket Rim with Chain Guide

This universally adaptable device has met the demand for a dependable means of operating overhead or inaccessible valves of every make and description.

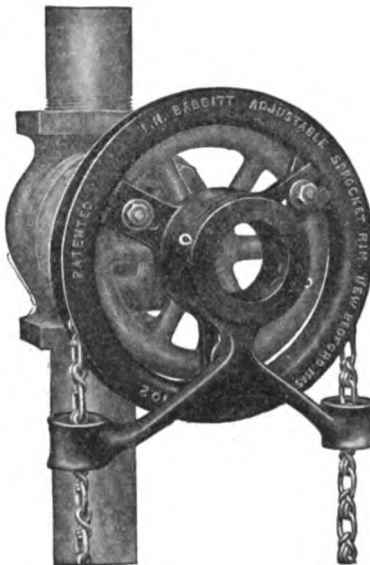
Noteworthy Features of Babbitt Rims—(1) The Babbitt Rim fits *any* valve, *any* style, with either rising or non-rising stems, and does away with all clumsy apparatus and specially made chain wheels.

(2) The use of the Babbitt enables you to install valves where they should be, without worry as to their accessibility.

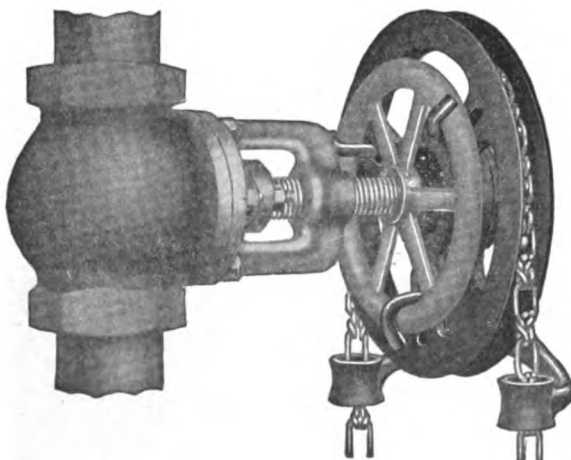
(3) The Babbitt standardization into ten sizes, applicable to the thousands of types and makes of valves has reduced the cost to a minimum.

(4) The Babbitt saves workmen bad falls, claims against yourselves, time, shut-downs and all manner of annoyances.

(5) The Babbitt clamps right on to the



FRONT VIEW OF BABBITT ADJUSTABLE SPROCKET RIM WITH CHAIN GUIDE



REAR VIEW SHOWING METHOD OF APPLICATION TO WHEEL AND NON-INTERFERENCE WITH RISING STEM

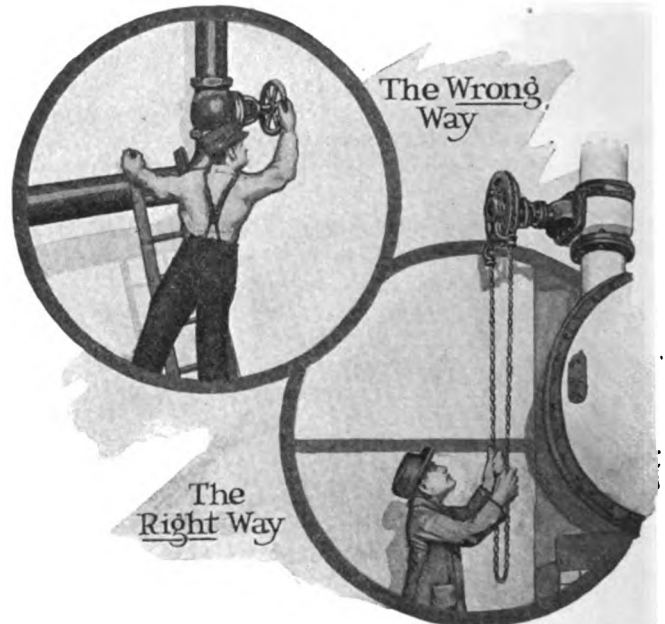
hand wheel now on the valve and can be attached in a few minutes.

(6) The Babbitt chain guide absolutely prevents the chain from coming off the sprocket rim.

SIZES

Size No.	Diameter sprocket wheel, in.	Diameter valve wheels rim will fit, in.	Size No.	Diameter sprocket wheel, in.	Diameter valve wheels rim will fit, in.
0	4	2 to 3 1/4	3	15 1/2	12 1/2 to 15 1/4
1	5 1/2	4 to 5 1/4	3 1/2	19	15 1/2 to 18 1/4
1 1/2	7 1/2	5 1/4 to 7 1/4	4	22	19 to 21 1/4
2	9	7 1/2 to 8 1/4	4 1/2	26	22 to 25 1/4
2 1/2	12 1/2	9 to 12 1/4	5	30	26 to 30

When ordering, give the diameter of the valve wheel to be fitted and number of feet of chain required.



COMPARATIVE METHODS OF OPERATING OVERHEAD VALVES
A Babbitt brings out-of-the-way valves within easy reach from the floor

Rus-go

Offers a method of sparing the hammer and saving the part. Comparatively a new product, it is gaining remarkable favor among mechanics and engineers as a saver of time, labor and replacements for breakage.

It is a chemical fusion of rust-eating oils, non-acid in nature, that penetrates the tightest of joints, loosens the rusted nut and removes every trace of rust from metal. A trial will repay the effort. Write for further information.

Put up in pint, quart, one-half gallon and gallon cans.



RUS-GO, THE EFFICIENT RUST SOLVENT

THE CHAPMAN VALVE MANUFACTURING CO.

Manufacturers of Sluice Gates

GENERAL OFFICE AND WORKS
INDIAN ORCHARD, MASS.

CABLE ADDRESS:
"VALVE, INDIAN ORCHARD"

BRANCH OFFICES

NEW YORK, N. Y.
CHICAGO, ILL.
CLEVELAND, OHIO

TULSA, OKLA.
BOSTON, MASS.
SAN FRANCISCO, CAL.

DETROIT, MICH.
SYRACUSE, N. Y.
PHILADELPHIA, PA.

LOS ANGELES, CAL.
PITTSBURGH, PA.
HOUSTON, TEX.

REPRESENTATIVES

ATLANTA, GA., W. J. NEVILLE, Candler Building
BEAUMONT, TEX., E. L. WILSON HARDWARE COMPANY

ST. LOUIS, MO., MIDWEST PIPING & SUPPLY CO.

Products

CHAPMAN SLUICE GATES, for hand, hydraulic, electric and pneumatic operation; SHEAR GATES, TIDE FLAP VALVES and MUD VALVES.

Also manufacturers of Butterfly Valves.

For Chapman Solid Wedge Gate Valves in bronze, semisteel and iron, in all sizes and for all pressures and purposes, and Floor Stands for valves and sluice gates, see pages 401-405.

Chapman Sluice Gates

Chapman sluice gates are furnished for a variety of services, such as intake gates for penstocks, waste gates for dams, controlling gates for tunnels and canals, inlet and outlet gates for filter plants, sewage disposal plants and reservoirs; distributing gates for reclamation and irrigation projects, etc.

The gates are designed with either circular or rectangular openings. Size of gate denotes the size of clear waterway through the gate.

Gates may be furnished with a standard frame, flanged frame, bell frame or spigot frame. Standard frame type has a wall flange to bolt against the face of the wall, and in addition a short spigot extension around the waterway to be embedded in the concrete. When standard frame type is furnished with top hook wedges, slots must be provided in the wall to permit hook wedges to travel up and down. The short spigot stiffens the frame, assists in carrying the load, and provides a short lining for the waterway. The flanged frame type may be bolted to a flanged type or directly



against face of the concrete wall. The spigot frame type is of the same general construction as the standard frame type, but the spigot is much longer and hence provides a superior lining for the waterway.

In the construction of Chapman sluice gates nothing but the best materials are used—cast iron for the gate frame, plug and guides; bronze for the wedges, adjusting screws and lock nuts, also for the faces of the plug and seat. All inside screw gates of standard construction are furnished with a solid bronze spindle and a bronze stem nut. On all gates the plug and seat faces are made of bronze, finished in the most approved manner to form a watertight joint when the gate is closed.

Both outside screw or rising spindle gates and inside screw or non-rising spindle gates are manufactured. The use of the rising spindle type, operated by a floor stand, is recommended, as the rising spindle is a perfect indicator of the position of the plug or gate and the threaded portion can readily be kept clean and properly lubricated.

Sluice gates should be installed so that they will be subject to face pressure, that is, that the pressure will force the plug to its seat on the frame.

Ball bearings are furnished where required or when specified. They are made of the very best materials, the race plates and balls being of tool steel, hardened and ground.

Sluice gates may be operated by hand, hydraulically, electrically or pneumatically. Hand operation is usually employed through the medium of a floor stand; and for electric operation, the motor is usually attached to the floor stand. Hydraulic cylinders may be either attached to the gate frame or mounted on the top of the dam or floor of the gate chamber.



FIG. 474A
Rectangular
Sluice Gate in
Concrete Dam



FIG. 475B
Self-contained or
Stationary
Spindle Circular
Sluice Gate



FIG. 482
Chapman Plug or
Mud Valve

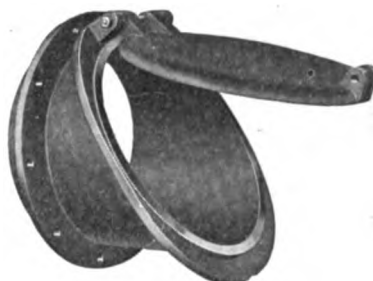


FIG. 487F
Chapman Tide Flap Valve
All sizes furnished, with connections
to meet every requirement



FIG. 490
Chapman Shear
Gates with
Bronze Seat

SHOWING PART OF COMPLETE LINE OF GATE VALVES, SLUICE AND SHEAR GATES, MUD VALVES AND FLOOD GATES FOR WATER, SEWAGE, FILTRATION AND IRRIGATION SERVICE

COFFIN VALVE COMPANY

GENERAL OFFICE AND WORKS
NEPONSET, SUBURB OF
BOSTON, MASS.

REPRESENTATIVES

NEW YORK, N. Y., C. W. BERGEN & Co., 256 Broadway
CLEVELAND, OHIO, TOMLINSON STEAM SPECIALTY Co., 1597 St. Clair Avenue
PHILADELPHIA, PA., DE HUFF & HOPKINS, Morris Building

SAN FRANCISCO, CAL., THEO. F. DREDGE, Monadnock Building
CHICAGO, ILL., WHITNEY & FORD, 4325 Cottage Grove Avenue
TORONTO, ONT., THE ARTHUR S. LEITCH Co., Ltd., 1001 Kent Building

Products

SLUICE GATES; GATE VALVES; NEEDLE VALVES; FOOT VALVES; SHEAR SEWER GATES; CHECK VALVES; FLAP VALVES; PLUG VALVES; BUTTERFLY VALVES; FIRE HYDRANTS; GATE HOISTS.

Also manufacturers of Automatic Sewage Regulators, Float Regulating Valves, Sewage Screening Presses, etc.

Service

This company furnishes designs and prices for all sizes and types of valves for use in connection with water power plants, water works, sewerage systems, irrigation projects, etc.

Coffin Sluice Gates

We furnish sluice gates for all kinds of service such as required in dams, power plants, water works, irrigation works, dry docks, etc. These gates are made in standard, circular or rectangular sizes and we have several different types suitable for the different services and pressures required. All necessary appurtenances are supplied with the gates, such as stems, stem guides and hoists. We have a great variety of patterns and can generally suit the requirements without necessitating special pattern costs.

In asking for quotations on sluice gates, it is very desirable that there be sent to us full information and a sketch of the proposed installation, if possible, so that we may determine what type of gate and operating mechanism best fulfills the conditions. The following information is essential:

- (1) Size of gate opening or required discharge. Whether circular or rectangular gate is preferred.
- (2) Method of attaching gate to masonry or pipe (spigot end to embed in masonry or flange end to bolt to concrete, pipe or wall thimble).
- (3) Maximum head above center of gate and direction of pressure (whether pressure tends to push disk against or away from seat).
- (4) Distance from center of gate to base of hoist; rising or non-rising stem; steel or bronze stem.
- (5) Type of hoist required—hand, electric or hydraulic cylinder.

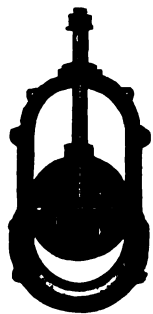


FIG. 81. CIRCULAR SLUICE GATE
Self-contained type; flange frame

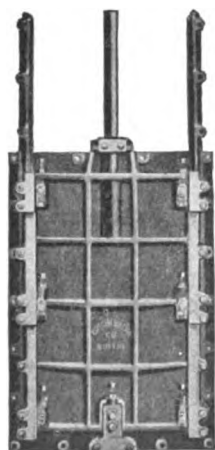


FIG. 57. COFFIN RECTANGULAR SLUICE GATE
Rising stem; spigot end; adjustable wedges



Coffin Gate Valves

We make a specialty of large gate valves for severe service, electrically and hydraulically operated.

Coffin Balanced Needle Valves

Special valves particularly suited to control the discharge from dams under high heads.

Coffin Foot Valves

Special types of foot valves having solid bronze flaps.

Coffin Shear Gates

As shown in Fig. 51; for light face pressures. Made from 4 to 20 in. in diameter.

Coffin Check Valves

Horizontal and vertical in all standard pipe sizes.

Coffin Flap Valves

Made in all standard pipe sizes with spigot or flange ends, single or double pivot.

Coffin Plug Valves

Also called drain or mud valves. Made in standard circular sizes.

Coffin Butterfly Valves

Made in all regular pipe sizes for operation by hand, electric or hydraulic power.

Coffin Fire Hydrants

We manufacture gate and compression fire hydrants.

Coffin Gate Hoists

We have a complete line of hoists for operating sluice gates, head gates and gate valves under all conditions by hand, electric or hydraulic power. Stands for severe service are equipped with ball bearings.

Other Products

We also manufacture many special devices such as sewage flow regulators, float regulating valves, sewage screening presses, etc.



FIG. 51. COFFIN SHEAR SEWER GATE
Bronze seats



FIG. 69. COFFIN FOOT VALVE WITH STRAINER



FIG. 451. COFFIN FLAP VALVE
Single pivot; flange end; bronze mounted

FLINN & DREFFEIN COMPANY

Gas and Fuel Engineers

431 South Dearborn Street
CHICAGO, ILL.

Products

Designers and builders of INDUSTRIAL FUEL EQUIPMENT including:

Anthracite Producer Gas Plants.

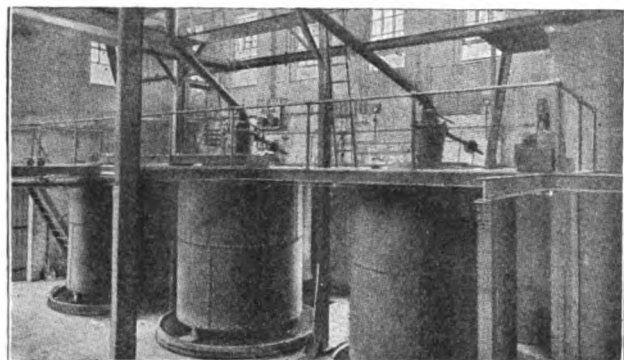
Bituminous Producer Gas Plants for making Raw Gas, or with Gas Washing Apparatus and Tar Extractors for producing Clean Gas.

Raw Producer Gas Burners.

Also manufacturers of Special Gas Apparatus for making Nitrogen, Carbon Monoxide or Carbon Dioxide.

Anthracite Producer Plant

This type of apparatus is suitable for producing gas used in soldering tin cans, canning, etc.; also for hardening, tempering, annealing and heat treating of steel.

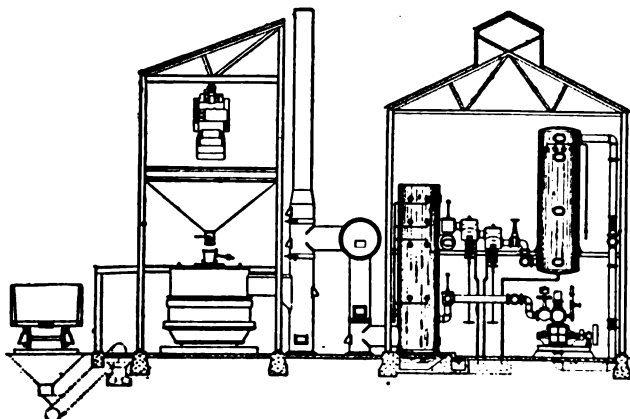


ANTHRACITE PRODUCER PLANT

Furnishing gas for bright annealing cold rolled steel, sherardizing, japanning and various operations formerly using city gas

Clean Bituminous Producer Gas Plant

This apparatus finds its field in factories where heating operations are widely scattered and at a considerable distance from the gas plant. It makes the cheapest industrial fuel gas available. This gas may be applied to almost every heating operation, as well as for gas engines.



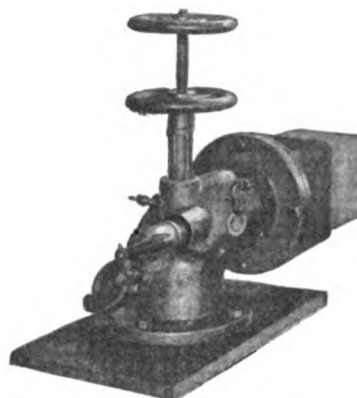
GAS CLEANING PLANT

In connection with large bituminous producer installation

Raw Producer Gas Burner

These burners can be applied to furnaces using fuel oil, coal or coke with virtually no material alterations.

Combustion is complete within the furnaces and there are no objectionable fumes or smoke emitted. Furnaces are readily adapted to raw producer gas burners.



FLINN & DREFFEIN RAW PRODUCER GAS BURNER

For displacing oil, natural gas, coal and coke in a wide range of industrial heating operations

Raw Bituminous Producer Gas Plant

This apparatus is especially suitable for making gas for heating reducing kettles, ovens, etc.; also for heating moderate temperature, direct-fired furnaces, such as are used in the hardening, tempering, annealing and heat treating of steel.



RAW BITUMINOUS PRODUCER GAS PLANT

In combination with a complete burner system for heating a double battery of asphalt stills

Services

For more than ten years, the FLINN & DREFFEIN COMPANY has designed and built fuel equipments for industrial and manufacturing purposes, covering the entire range of heating and burner operations, and is in a position to offer only that equipment which is most suitable to the manufacturer's needs. Fuel systems of its design can be seen in successful operation in many leading factories throughout the country.

Information Required

In the nature of things, nearly every proposition must be specially considered before definite recommendations can be made regarding the apparatus involved. In writing, please describe as fully as possible the requirements, giving kind and quantity of fuel used and nature of heating operations to be performed.

THE SMITH GAS ENGINEERING CO.

Cleaned Gas Producer Plants

DAYTON, OHIO

FACTORIES: DAYTON AND LEXINGTON, OHIO

SOLE CANADIAN REPRESENTATIVE: THE CANADIAN ALLIS-CHALMERS, LTD., TORONTO

Products

Designers and builders of GAS PRODUCER PLANTS for power service and industrial heating, including plants to furnish cleaned gas for melting, annealing, heat treating and re-heating metals and glass; also for enameling ovens, for baking and drying and for use in foundries.

Also manufacturers of Smith Recording Gas Calorimeter; Gas Valves for hot and cold gas, Tar Extractors for coke oven or producer gas, etc.

Experience

THE SMITH GAS ENGINEERING CO. is a pioneer in gas producer work, Smith suction gas producers having been in successful commercial operation since 1902. Over 80,000 h.p. have been installed, ranging in size from 25 to 3000 h.p. in single units, operating on a wide range of fuels, and furnishing gas for both power and heating.

Economy

Producer gas is rapidly becoming recognized as the most efficient and desirable agent to use for power or heating operations. Smith plants produce 1 h.p. on 1 lb. of anthracite coal, on 1.25 lbs. of bituminous, and on 1.75 lbs. of lignite—about one-third the fuel consumption per horsepower of a highly efficient compound condensing steam engine.

Cold Cleaned Gas

All Smith plants supply a uniform quality of cleaned gas which can be distributed from one central plant to any distant point just as natural or city gas is distributed; no large refractory ducts are necessary as when "hot" or "raw" gas is used; no clogging of mains.

Special Features

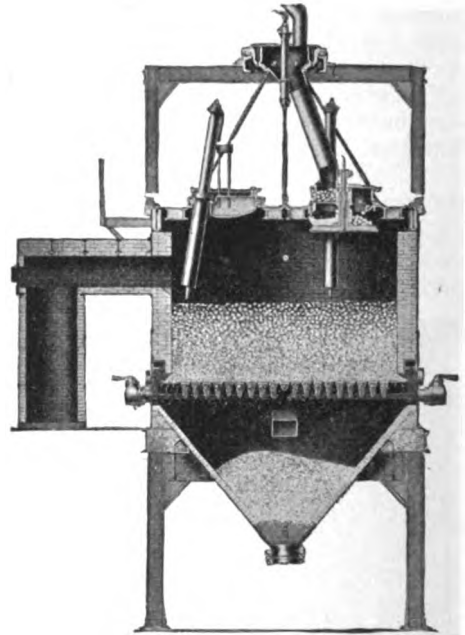
(a) All Smith gas plants operating on bituminous coal or lignite are equipped with the Smith glass wool tar extractor guaranteed to be 99.5% efficient.

(b) All tar extracted from the gas is returned to the producer and converted into a fixed gas. This adds greatly to the over-all efficiency of the plant and the quality of the gas delivered.

(c) All Smith producers are equipped with automatic means of proportioning air and water vapor in the blast. This insures a very uniform gas quality on varying loads.

Types of Plants

Type E Producer—For anthracite. Built in 11 sizes from 25 to 300 h.p. They are guaranteed to deliver 75% of the heat value of the coal in gas of at least 135 B.t.u. per cu. ft. when producer is operated at rated load. Described in Bulletin 12.



TYPE G MECHANICALLY OPERATED PRODUCER FOR LARGE CAPACITY GAS PRODUCTION FROM BITUMINOUS COALS

Type BF Producer—For bituminous coal and lignite. Gas is entirely cleaned by means of the Smith Type F tar extractor. Any degree of cleanness can be secured by means of this equipment. Made in a range of sizes up to 400 h.p. or 4,000,000 B.t.u. per hour (in single units). Described in Bulletin 17.

Type G Producer—A high duty bituminous producer, mechanically operated to meet the present-day demand for large gas capacity with low labor costs. The producer is mechanically poked by positive, steam driven pokers. Capacity 800 to 2000 lbs. of coal per hour; 9 to 16 ft. diameter. Described in Bulletin 16.

Type EP Producer—For coke, charcoal, and semianthracite. Described in Bulletin 12A.

References

Armstrong Cork Co., Beaver Falls, Pa.
U. S. Cast Iron Pipe & Foundry Co., Bessemer, Ala.
National Lamp Works of General Electric Co., Cleveland, Ohio
Timken-Detroit Axle Co., Detroit, Mich.
Ford Motor Co., Detroit, Mich.
Ford Motor Co. of Canada, Ltd., Walkerville, Ont.
J. M. Horton Ice Cream Co., Brooklyn, N. Y.
Staten Island Shipbuilding Co., Port Richmond, N. Y.
American Cotton Oil Co., Guttenberg, N. J.
Reliance Manufacturing Co., Massillon, Ohio
Robbins & Meyers Co., Springfield, Ohio
Jeffrey Manufacturing Co., Columbus, Ohio
Crucible Steel Company of America, Harrison, N. J.
San Antonio Portland Cement Company, San Antonio, Tex.
Halcomb Steel Co., Syracuse, N. Y.
Kellogg Toasted Corn Flake Co., Battle Creek, Mich.

AMERICAN CHIMNEY CONSTRUCTION CO.

(Not Incorporated)

Radial and Common Brick Chimneys

TELEPHONES
FRANKLIN 2594, 2595

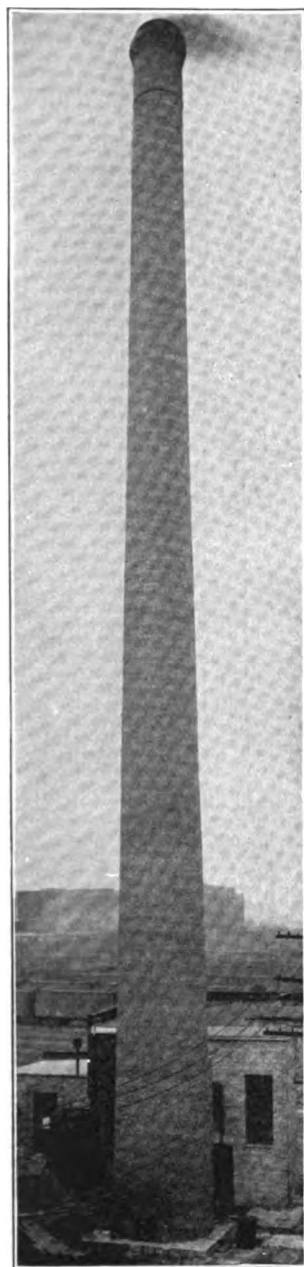
118 North La Salle Street
CHICAGO, ILL.

BRANCH OFFICE; 726 Stock Exchange Building, PHILADELPHIA, PA.

Products and Services

PERFORATED RADIAL and COMMON BRICK CHIMNEYS, Designed and Constructed for all purposes, and of all sizes.

OLD CHIMNEYS EXTENDED, REPAIRED, STRAIGHTENED, and POINTED while in operation; REPORTS and RECOMMENDATIONS on condition of old chimneys; STEEL STACKS LINED.



CHIMNEY 140 FT. HIGH FOR
CHICAGO JUNCTION
R. R. Co.

Engineering Service and Facilities

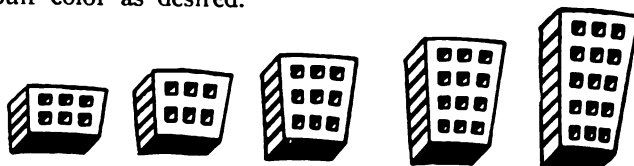
Reliable information, and recommendations will be given by our engineers regarding the proper dimensions of chimneys with full consideration of the purpose for which they are designed. Advice will be given as to boiler arrangements and other conditions.

Twenty-six years' experience in building chimneys in all parts of the world enables us to render the most efficient and economical service in all the details involved.

Perforated Radial Chimneys

The purest materials only are used in making the radial blocks and are chosen for their great refractory qualities and high crushing strength. These materials are so combined in the proper proportions as to insure a chimney with the maximum resistance to strains of every nature to which it may be subjected.

Radial bricks can be furnished in red or light buff color as desired.



PERFORATED RADIAL BLOCKS

Common Brick Chimneys

The AMERICAN CHIMNEY CONSTRUCTION Co. also builds round common brick chimneys of inside top diameter from 3 ft. 6 in. and larger.

These chimneys are just as good looking and durable as the radial brick chimneys; they have been in use for many years and have given universally good results and satisfaction.

Data Required for Chimney Designs and Estimates

Give all possible information regarding place, transportation, dimensions of chimney required, boiler horsepower, probable temperatures, etc.

State nature of soil where chimney will be erected.

Give local prices for necessary building material.

In accordance with the above information, designs and lowest estimates of the chimney needed will be submitted.

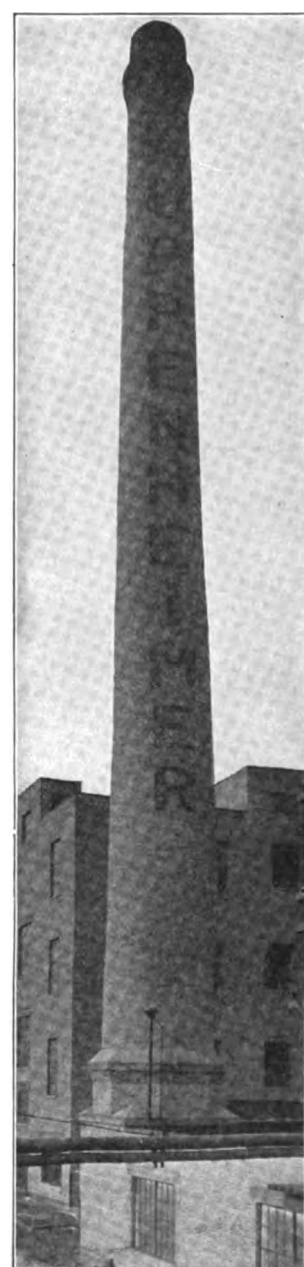
Chimney Repairing

Chimneys extended with no interference to operation of plant.

Dimensions of chimney are desired or a plan of it.

Old chimneys repaired, straightened, pointed and banded while in operation.

Inspections made on the condition of old chimneys and reports furnished.



CHIMNEY 150 FT. HIGH FOR
B. KUPPENHEIMER & Co.,
CHICAGO, ILL.

AMERICAN CHIMNEY CORPORATION

Designers and Builders of Chimneys

TELEPHONE
STUYVESANT 3735, 5741

147 Fourth Avenue
NEW YORK, N. Y.

BRANCHES

PHILADELPHIA, PA., Stephen Girard Building
CHICAGO, ILL., 1101 Security Building

CLEVELAND, OHIO, 919 Ulmer Building
BOSTON, MASS., 141 Milk Street

Products

PERFORATED RADIAL BRICK CHIMNEYS.
COMMON BRICK CHIMNEYS.
CHIMNEY REPAIRS.
LININGS FOR STEEL STACKS.

Services

The AMERICAN CHIMNEY CORPORATION designs and builds perforated radial brick and common brick chimneys of all sizes and for any purpose, such as boiler operation, smelter plants, chemical plants (acid gases), crematories and incinerators (high temperatures).

We also make a specialty of the repair and extension of old chimneys; design and construction of ornamental chimneys; inspection and repair of lightning-rods on chimneys; refractory linings for steel stacks.

Perforated Radial Brick Chimneys

The AMERICAN CHIMNEY CORPORATION constructs their chimneys of special bricks which are perforated and are shaped to the circular and radial lines of the chimney, producing, when in place, smooth and true inner and outer surfaces.

The perforations in the brick permit a thorough burning. In the wall they form insulating dead air spaces which reduce radiation, resulting in fuel economy.

The mortar extends into the perforations, thoroughly bonding the bricks together and adding greatly to the stability of the chimney.

Steel bands are provided for in the wall as safeguards against cracking.

Joints are broken in every course, horizontally and vertically.

The chimneys are built from inside without scaffolding, greatly reducing the cost and time of erection.

Radial bricks are made of tested clays of a highly refractory nature and are acidproof and weatherproof.

Common Brick Chimneys

The AMERICAN CHIMNEY CORPORATION is prepared to erect chimneys of common brick, round, square or octagonal, to suit special architectural requirements.

Estimates

When asking for information or estimates, kindly advise on the following points:

(1) Intended use of chimney (boiler furnace, smelter, chemical plant, incinerator).

(2) Height above foundation and diameter or boiler horsepower or number and dimensions of boilers.

(3) If a bid is desired on foundation, give character of soil.

(4) Does chimney stand independent of building? If it is a part of the building, state for what height.

(5) Give hauling distance from purchaser's railroad siding or nearest railroad freight yard.

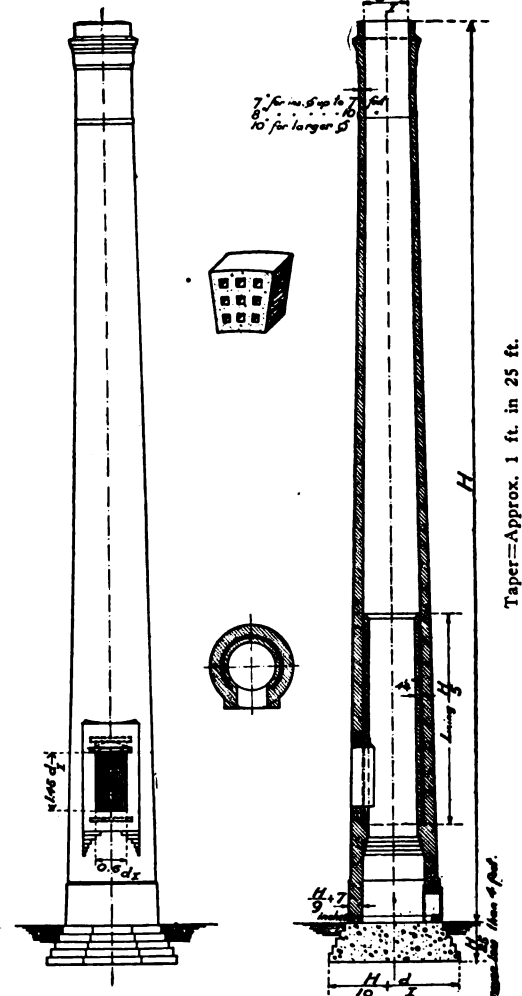
(6) If possible, give approximate prices of building materials and wage scale of local common labor.

(7) Color of bricks desired.

Construction Data

For general layouts it is often desirable to have some preliminary information available and for this purpose we submit the following data for designs.

For additional construction data, send for our catalogue.



DESIGN DATA—CHIMNEY FOR BOILER OPERATION
In chimneys for other purposes, the extent of the fire brick lining is varied to suit the stack temperature

Some Recent Installations

	Height, ft.	Diam., ft. in.
Pennsylvania R. R. Co., Altoona, Pa.	175	8-6
New Jersey Zinc Co., Palmerton, Pa.	200	14-0
Owens Bottle Machine Co., Glassboro, N. J.	150	6-0
Dwight P. Robinson & Co., Inc., New York, N. Y.	271	21-0
Viscose Co., Marcus Hook, Pa. (2 chimneys)	208	10-6
Viscose Co., Marcus Hook, Pa. (2 chimneys)	60	3-6
Viscose Co., Lewiston, Pa.	300	22-0
Whitall-Tatum Co., Millville, N. J.	150	6-6
New Departure Mfg. Co., Meriden, Conn.	150	7-6
Hartford Fire Insurance Co., Hartford, Conn.	150	7-0
Hoover Suction Sweeper Co., Canton, Ohio	175	8-0
Victor Talking Machine Co., Camden, N. J.	176	9-0
Sanford Mills, Sanford, Me.	170	8-0
Boston & Albany R.R. Co., West Springfield, Mass.	150	6-6
Jessup & Moore Paper Co., Wilmington, Del.	175	9-6
Norfolk & Western Ry. Co., Roanoke, Va.	200	10-0
Frankford Arsenal, Philadelphia, Pa. (2 chimneys)	200	12-0

ALPHONS CUSTODIS CHIMNEY CONSTRUCTION CO.

TELEPHONE
CORTLANDT 8428

Bennett Building—95 Nassau Street
NEW YORK, N. Y.

CABLE ADDRESS
"CUSTOS, NEW YORK"

ATLANTA, GA., Healey Building
BALTIMORE, MD., Equitable Building
BOSTON, MASS., 51 Ellery Street
CHICAGO, ILL., Marquette Building

AMERICAN BRANCH OFFICES
CLEVELAND, OHIO, Guardian Building
DETROIT, MICH., Moffat Building
MILWAUKEE, WIS., Wells Building
PHILADELPHIA, PA., 315 South 15th Street

PITTSBURGH, PA., Empire Building
PORTLAND, ORE., 222 Pine Street
RICHMOND, VA., American National Bank Building
SEATTLE, WASH., Colman Building

MONTREAL, QUE., 10 Cathcart Street

CANADIAN BRANCH OFFICES

TORONTO, ONT., Kent Building

Products and Services

Designers and Builders of PERFORATED RADIAL BRICK CHIMNEYS, with FOUNDATIONS and FLUES, of all sizes, for boilers, furnaces, crematories and ovens; CHIMNEYS for smelters, hotels and office buildings; ACIDPROOF CHIMNEYS for paint works and chemical plants; HIGH TEMPERATURE CHIMNEYS for garbage destructors and incinerators; KILNS, BOILER SETTINGS, ETC.; REPAIRING and HEIGHTENING OLD CHIMNEYS; LIGHTNING RODS Installed and Repaired.

Specifications, plans, designs and data furnished free on request.

The ALPHONS CUSTODIS CHIMNEY CONSTRUCTION Co., through its fifty years of experience, is equipped to give expert advice as to the size and shape of any kind of a chimney, for any purpose, as well as make recommendations through its engineers regarding boiler layouts and size, shape and design of flues.

The boilers, the design of flues, the coal used, temperatures, gases generated, geographical location and many other conditions affect the determination of the most economical and efficient size of a chimney. State conditions and the results desired, and our engineers will promptly furnish the correct, efficient and economical size and design of chimney. They will make recommendations, not from theoretical tables, but from over fifty years' experience and unpublished data collected from actual working conditions of our chimneys all over the world.

The fact that over 10,000 Custodis radial brick chimneys are now in successful operation is conclusive proof of their efficiency, permanency and economy.

Perforated Radial Brick Chimneys

The perforated radial blocks are made only from the purest clays, selected for high refractory powers and high crushing strength. Special attention is given in the brickyards to making the proper mix of clays in the right proportion to produce a radial brick chimney which will resist heat strains, as well as strains from weight and wind. All the radial blocks are formed to suit the circular and radial lines of each part of the chimney, so that they can be laid with thin, even joints and produce a regular smooth surface.

The blocks are larger than common bricks, making the number of mortar joints



in a radial brick chimney one-third of those in a common brick chimney of the same size. Moulded with vertical perforations, the radial blocks are most thoroughly and uniformly burned, materially increasing their density and strength. The perforations form a dead air space around the chimney, insulating the hot column of rising gases on the inside from sudden changes of temperature of the outer air. This results in a maximum draft under all conditions.

Repairing and Heightening

We make repairs to radial, common brick and concrete chimneys. Work done while chimney is in operation, if necessary.

Old chimneys can be heightened without any interruption to the plant.

Send the height, inside diameter at the top, width at base and wall thickness, or a plan of the old chimney. The engineering department will furnish design and figure on heightening it. Old brick chimneys can be removed without danger.

We inspect old chimneys and make reports and recommendations on their condition.

Lightning Rods

Lightning rods installed and repaired. Special lightning rods for acid chimneys.

Flues and Kilns

This company designs and constructs flues and furnaces. It makes a specialty of building kilns of all kinds. Steel stacks, etc., lined.

Information Required for Estimates

Name of place where chimney is to be erected. On what railroad siding is same located. Distance from siding delivery to chimney site. Is chimney to be used for boiler drafts or other purposes.

Give probable temperatures of the flue gases. If for boiler draft, what is total horsepower. Kind of fuel or coal to be used. Amount consumed per horsepower or total per hour.

Dimensions of chimney required—diameter; height.

Is arrangement for overhead or underground flue. Give dimensions and shape of flue opening desired in chimney.

Give height of same above or below foundation top.

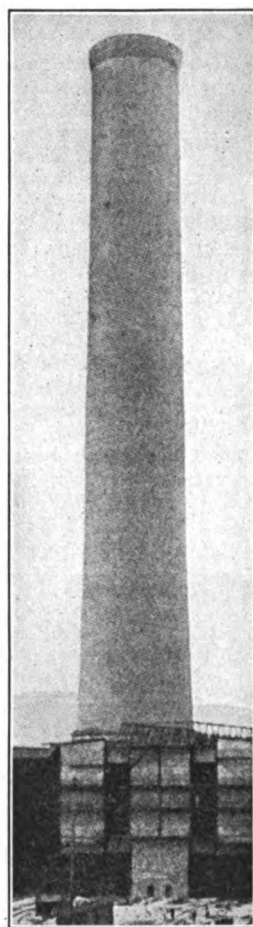
What is nature of soil where chimney will stand. What is estimated safe load per square foot.

What depth of excavation is necessary to reach good soil.

What is latest date allowed for erection of chimney.

Sketch showing arrangement of building, boiler and chimney.

Local prices—red brick, lime, cement and sand.



TALLEST AND LARGEST
CHIMNEY IN THE
WORLD BUILT FOR
ANACONDA COPPER
MINING COMPANY,
ANACONDA, MONT.

Height above grade, 585 ft.
Inside diameter at top, 60 ft.
Built in 1918

THE HEINE CHIMNEY CO.

Engineers and Builders of Radial Brick and Concrete Chimneys

30 Church Street
NEW YORK, N. Y.

123 West Madison Street
CHICAGO, ILL.

Products

Engineers and builders of RADIAL BRICK and CONCRETE CHIMNEYS.

Also Concrete Tanks and Towers for all industrial purposes.

Services

THE HEINE CHIMNEY CO. have a skilled and experienced organization for the designing and construction of chimneys, tanks and towers. As a result of close application for many years in radial brick and concrete construction, our engineers are in a position to render a most valuable consulting service to engineers and others who are intending to build either chimneys, tanks or towers. A vast accumulation of data in our possession, and which is not ordinarily available, is at the disposal of our engineers for their use in determining the most efficient type and size of chimney required to meet any existing conditions. We are prepared to undertake contracts for the construction of either brick or concrete chimneys in any part of the world.

Heine Radial Brick Chimneys

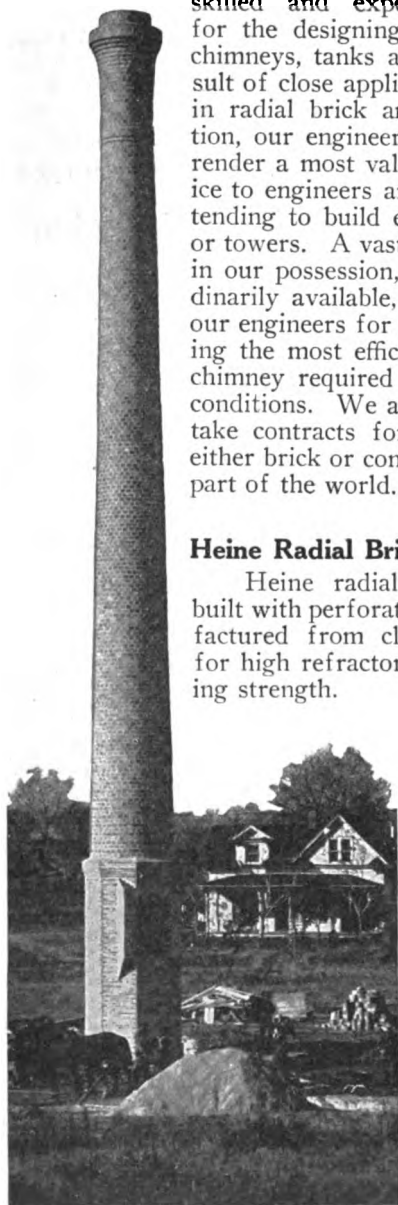
Heine radial brick chimneys are built with perforated radial brick, manufactured from clays specially selected for high refractory qualities and crushing strength.

Heine Concrete Chimneys

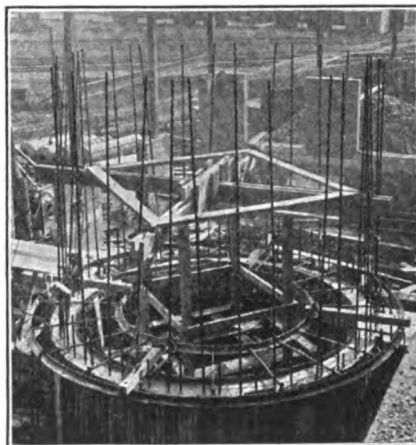
Heine concrete chimneys are constructed with all steel outer and inner forms, covered by patents, assuring a true and concentric chimney with uniform taper. They are built with a wet mixture, and reinforced with steel bars and triangular wire mesh as manufactured by American Steel & Wire Company.

Some Representative Clients

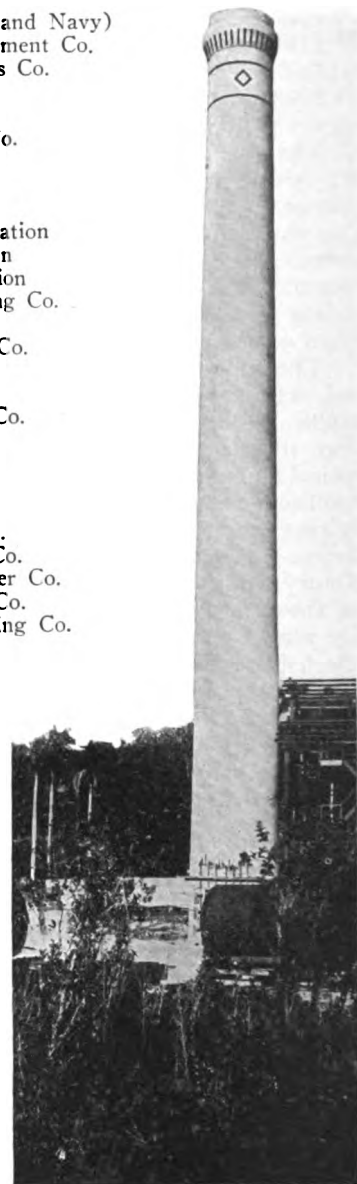
U. S. Government (Army and Navy)
Knickerbocker Portland Cement Co.
National Malleable Castings Co.
Standard Oil Co.
Morton Salt Co.
New York Central R. R. Co.
Pennsylvania R. R. Co.
Barrett Co.
H. J. Heinz Co.
United States Steel Corporation
General Motors Corporation
Stone & Webster Corporation
Harry M. Hope Engineering Co.
Jas. Stewart & Co.
American Car & Foundry Co.
General Electric Co.
Pressed Steel Car Co.
United Gas Improvement Co.
Henry L. Doherty & Co.
Vacuum Oil Co.
Godchaux Sugars, Inc.
American Hominy Co.
Electric Bond & Share Co.
American Sugar Refining Co.
Washington Pulp and Paper Co.
Pacific Power and Light Co.
Peet Brothers Manufacturing Co.
Sinclair Oil Refining Co.
Erie R. R. Co.



HEINE RADIAL BRICK CHIMNEY CON-
STRUCTED FOR THE DENVER
UNION WATER WORKS



VIEW LOOKING DOWN ON STEEL FORM IN
PLACE FILLED WITH CONCRETE



HEINE CONCRETE CHIMNEY CON-
STRUCTED FOR THE KNICKER-
BOCKER PORTLAND CEMENT CO

H. R. HEINICKE, INC.

Builders of Radial Brick Chimneys

540 North Meridian Street
INDIANAPOLIS, IND.

147 Fourth Avenue
NEW YORK, N. Y.

FACTORY: NEWCOMERSTOWN, OHIO

BRANCH OFFICES

ATLANTA, GA.	BUFFALO, N. Y.	CHICAGO, ILL.	CLEVELAND, OHIO	KANSAS CITY, MO.	MEMPHIS, TENN.
BOSTON, MASS.	CHARLOTTE, N. C.	CINCINNATI, OHIO	DETROIT, MICH.	LOS ANGELES, CAL.	MILWAUKEE, WIS.
MONTREAL, QUE.	NEW ORLEANS, LA.	PHILADELPHIA, PA.	PITTSBURGH, PA.	ST. LOUIS, MO.	

Products and Services

Specialists for 20 years in the design and construction of PERFORATED RADIAL BRICK CHIMNEYS and accessory structural members, including Foundations, Boiler Setting and Brick Furnaces.

Manufacturers of PERFORATED RADIAL BRICK.

Also, Grain Elevators, Tanks and Silos.

Rush work a specialty. Material always ready for immediate shipment from the factory.

Heinicke Radial Bricks and Chimneys

Heinicke chimneys are constructed of specially formed perforated bricks manufactured by Heinicke themselves. These bricks are shaped to the circular and radial lines of the chimney, producing, when in place, smooth and true inner and outer surfaces.

They are hard burned, regular in shape, sound ringing, weatherproof and acidproof. Produced from selected, chemically tested and carefully proportioned refractory fire clay and shale.

The perforations permit of thorough burning of the bricks, assuring a product which is highly resistant to acids, heat, weather and other deteriorating influences.

Our brick plant is run as a part of this business and not as a separate enterprise. It is the only brick plant in the United States which makes a specialty of radial bricks. Radial bricks are produced by other brick makers simply as a side line in connection with their regular business and, of course, the same care and attention can not be given. The Heinicke bricks are superior to the brick ordinarily used and are made by this company to maintain a high standard of excellence.

Since we manufacture the brick and erect the chimneys by our own organization, full responsibility is assumed for results without question or argument.

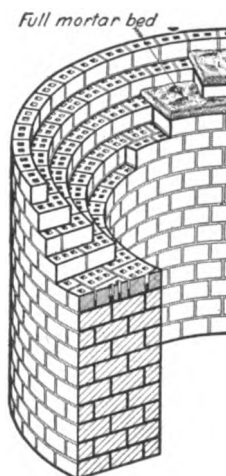
Heinicke chimneys are bonded in every direction at all courses. This, with the concealed reinforcement employed, enables us to absolutely guarantee chimneys against cracking, except from unusual cause or abuse.

Heinicke designed chimneys have been erected in Europe and America and thousands are in operation today as examples of their success. As specialists in the engineering and designing of chimneys, this company's experience is available to engineers, architects, contractors and owners.

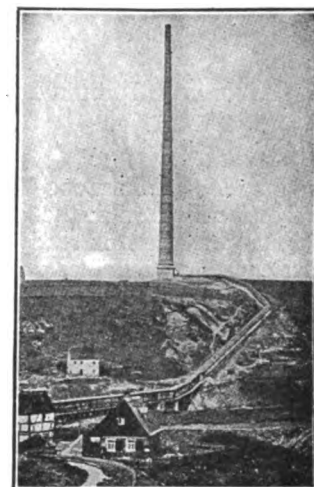
Features of Design and Workmanship

(A) Perforations in radial bricks form insulating dead air spaces in wall of chimney, which reduce radiation and prevent sudden temperature changes within chimney, resulting in a considerable saving in fuel. Mortar slightly extends into perforations, forming an anchorage that adds greatly to stability of chimney.

(B) Concealed steel bands are used in reinforcing chimney; these add materially to strength in resisting stresses due to expansion, and insure safety against cracking.



SECTIONAL DETAIL OF
CHIMNEY SHOWING
HEINICKE BOND



HEINICKE CHIMNEY SERVING
A SMELTER
Height, 460 ft.; clear diameter at
top, 8 ft.

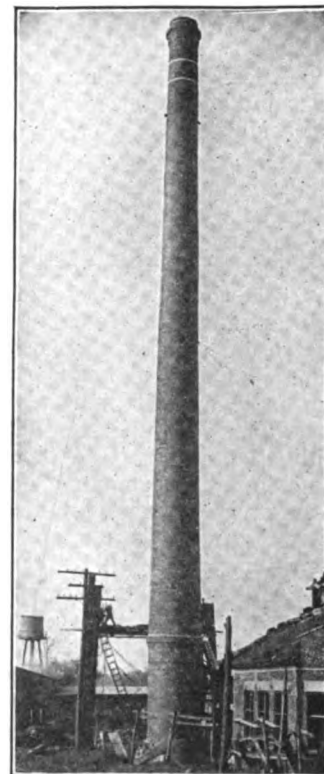
(C) The Heinicke system of bonding provides for breaking of joints between courses, so that no vertical joint is higher than one brick. Every course is thoroughly bonded through use of bricks varying in length from 4 to 10 in. (See sectional detail.) This method of bonding gives greater compressive strength and resistance to lateral stresses than other systems; the increase in strength over the common bond amounts to about 300%.

(D) Erection of chimney is done from inside, doing away with outside scaffolding and eliminating accompanying dangers to workmen as well as unnecessary cost.

Estimates

Please advise us on the following points:

(1) Distance from nearest railroad siding or team track. (2) Intended use of chimney (boilers, furnaces, incinerators, smelters). (3) Height and diameter, or boiler horsepower, or type, number and dimensions of boilers. (4) Kind of fuel to be used. (5) Character of soil for foundation. (6) Approximate price of cement, lime, sand, gravel, crushed stone and common hard brick, delivered at chimney site.



PASSAIC METAL WARE CO.,
PASSAIC, N. J.
Height, 125 ft.; clear diameter at
top, 3 ft.

THE M. W. KELLOGG COMPANY

Manufacturers of Perforated Radial Brick Chimneys

140 Cedar Street
NEW YORK, N. Y.

BRANCH OFFICES

BOSTON, MASS.

PHILADELPHIA, PA.

CHICAGO, ILL.

PITTSBURGH, PA.

LOS ANGELES, CAL.

SAN FRANCISCO, CAL.

MONTREAL, TORONTO, WINNIPEG, CAN., CANADIAN KELLOGG Co., LTD.

Products

PERFORATED RADIAL BRICK CHIMNEYS.

Service

THE M. W. KELLOGG COMPANY has erected some of the finest chimneys in the United States during the last eighteen years, and is ready to share the results of that experience with engineers and architects who are engaged in problems where chimney construction is required.

This company's engineers will be glad to advise on types, sizes, shapes, etc., of chimneys for any condition that may arise.

Kellogg Perforated Radial Brick Chimneys

No artificially produced material for the construction of the modern factory chimney compares with refractory clay. This raw material is put through a variety of scientific treatments by skilled hands and especially designed machines before it comes from the kilns in the form of perforated radial brick ready for shipment, and for use in chimney construction.

Each brick is formed to occupy a certain position in the circular and radial lines of the chimney, as shown by the drawing on this page, and is sound ringing, hard, well burned and free from checks.

Bricks are made to conform closely with the circular and radial lines of the shaft and are weatherproof and acidproof.

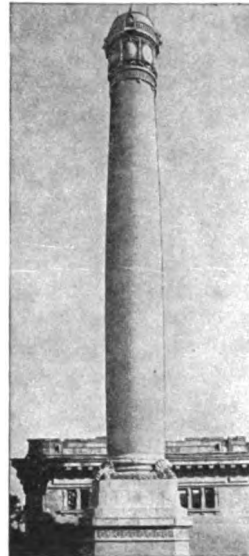
The total amount of perforations does not exceed one-fourth of the cross area of the brick, which are tested to a crushing strength of not less than 6000 lbs. per sq. in.

The perforations in the radial bricks form a dead air space about the core of the chimney. This has a marked effect in reducing amount of fuel used, in preventing sudden changes of temperature within the chimney, and in reducing radiation. Thus a uniformly maximum draft is maintained in any kind of weather.

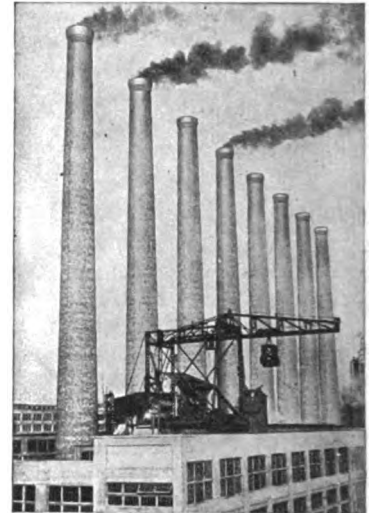
A trained superintendent of construction, familiar with all the details of the plans and specifications of the chimney, accompanies each shipment of radial brick, to supervise unloading and stacking in the order of their use. Throughout the entire construction the bricks of each tier reach their final place under his direction.

An expert mortar man supervises the preparation and use of all of the mortar. The tensile strength of the chimney, its ability to withstand heat and cold and to defy all sorts of weather from without and all sorts of gases from within, depend largely upon this mortar. Each brick is laid in so full a bed of mortar that the latter enters the perforations of the brick from 1 to 1½ in. The joints are struck both inside and out.

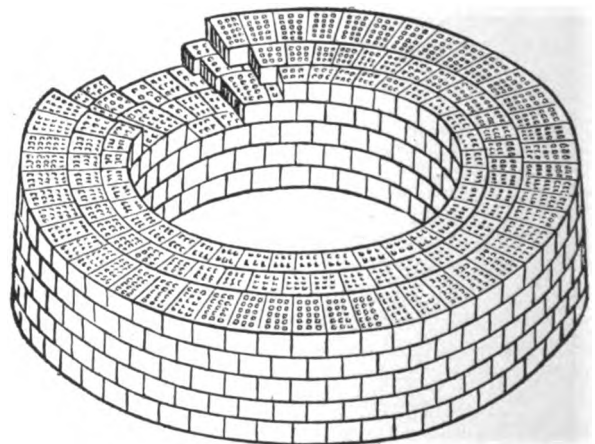
A crew of trained men in scientific chimney construction carry forward the erection of the chimney



QUEEN LANE FILTER
PLANT
PHILADELPHIA, PA.



CORN PRODUCTS REFINING Co.,
ARGO, ILL.



METHOD OF USING M. W. KELLOGG'S PERFORATED RADIAL
BRICK IN CHIMNEY CONSTRUCTION

from start to finish, insuring careful construction and the proper grading and matching of brick throughout.

Standard Specifications for Perforated Radial Brick Chimneys

Scope—The work included under this contract is to consist of all labor and material necessary for the erection complete of one radial brick chimney in accordance with this specification, which shall become a part of the contract. The proposal shall include all scaffolding, cartage, unloading of material and removal of rubbish necessary to leave the chimney in a first class condition ready for operation.

Delivery—The chimney will be built at.....
located on the.....
railroad.

Material may be unloaded on owner's siding, which is
 with.....of the chimney site.

Space—Sufficient storage room for chimney contractor's materials will be provided adjacent to chimney as well as unobstructed access from transportation delivery to the site of chimney for delivery and removal of materials and tools. At least one side of chimney will be left free and open by the owners for hoisting and working space until the chimney is completed.

Water—The owners will provide the chimney contractor with necessary water within 50 ft. of the site of the chimney free of expense to the chimney contractor. From this point the chimney contractor will make his own hose connections, if required.

Workmanship and Materials—All workmanship and materials shall be first class.

The chimney contractor shall furnish a competent foreman under whose supervision the chimney will be built. Chimney must be built in a thorough, complete and workmanlike manner.

Time of Completion—The chimney contractor shall state in bid the guaranteed number of working days in which he will finish the chimney after receipt of signed contract and approved drawings.

Foundation—Proper foundation will be built by the owner from plans and specifications to be furnished by the chimney contractor, who will, on completion, give in writing his approval of the foundation as being sufficient to sustain the chimney and fulfil the guarantee.

Note: In case, however, it is desired to have chimney contractor build the foundation, the following may be used:

The chimney contractor shall furnish a concrete foundation of proper depth and spread to safely sustain the chimney. The foundation shall not be loaded to more than.....tons per sq. ft., which is the safe bearing value as determined for this work.

Excavating shall be done by contractor for foundation.

The concrete shall be composed of cement, sand, stone or gravel in the proportion of 1 part cement to 2½ parts sand and 5 parts of stone or gravel. It shall be deposited in the forms in layers not to exceed 6 in. in thickness and thoroughly rammed into place. Concrete shall be a wet mixture.

Design—The design of the chimney shall conform to the following dimensions as shown on drawing attached:

Height above top of foundation.....ft.in.
 Minimum internal diameter.....ft.in.

The wall of the column shall have one straight and true batter from top to bottom. The wall thickness and section lengths to be as shown on drawing. In case the contractor's standard wall thickness should not be exactly as shown, a variation of 3% will be allowed in either direction.

Base—If chimney is to be built with base and column construction, use the following:

The base of the chimney shall be built [here fill in shape of base] in shape.....ft. high, of the dimensions shown on drawing, of straight, hard, well burned, well shaped common building brick laid in full bed of cement lime mortar as herein specified.

Note: If round for the entire height, specify as follows:

The chimney shall be built of perforated radial brick for the entire height, as hereinafter specified.

Radial Brick—All radial brick shall be best quality, moulded from refractory clay, sound ringing, hard, well burned, well shaped, of reasonably even color and free from checks; made to closely conform with the circular and radial lines of the shaft, and shall be weatherproof and acidproof. They shall have a water absorption of not less than 5% nor more than 12% of their dry weight after immersion for a period of 24 hours; and shall have a crushing strength of not less than 6000 lbs. per sq. in. The total amount of perforations shall not exceed one-fourth of the cross area of the brick. One cu. ft. of radial brickwork shall weigh not less than 120 lbs. The outside faces of the brick shall be of regular size, so that the general appearance of the brickwork will be neat and uniform.

Lining—The chimney shall have an expansion lining built of perforated radial fire brick 4¼ in. thick,ft. high from a point 2 ft. below the bottom of the flue opening. The lining prevents flue gases from coming in contact with the solid masonry of which the shell is built, and shall be separated from same by an air space of not less than 2 in.

The lining shall be built after the chimney is finished, and exceptional care must be taken to keep the air space clear and free of loose mortar and other dirt.

Rack out the shell of the chimney approximately 2 in.

above lining, to form a ledge for the purpose of diverting the falling soot when the chimney is in operation.

Mortar—All brickwork shall be laid in cement lime mortar, as hereinafter specified, with courses level and with full joints throughout. Face brickwork and backing to be laid up at the same time with joints of reasonably even thickness, not exceeding ½ in. The mortar to be used in the chimney shall consist of 1 part portland cement, 2 parts fresh burnt lump lime mortar and 5 parts clean, sharp sand. The cement to be added to the sand and lime mortar as the mortar is required, and no mortar having taken an initial set is to be used. The cement must not be added until the lime is cool. The sand shall be clean and sharp, free from loam, vegetable matter and large pebbles. If necessary, it must be both screened and washed.

Bond—All common brickwork shall have every fourth course a header course.

Radial brickwork shall be bonded every three courses.

Breeching Opening—One opening shall be provided in chimney. The opening to be lined on the reveals with refractory material. The masonry above the opening to be supported by heavy I-beams set on steel plates, with air spaces at each end for expansion. Under these I-beams a flat masonry arch shall be built to properly protect the beams from the effect of the gases. The flue opening shall be reinforced laterally by heavy tie rods and plates over the top and at the bottom.

Steel bands, ¾ by 3 in., to be placed in the masonry above and below opening.

The opening shall be.....wide by.....high, the bottom of which shall be approximately.....above foundation.

Reinforcing Rings—The chimney contractor shall place in the brickwork at every change in wall thickness steel bands ¾ in. thick by 3 in. wide.

If the contractor should furnish perforated radial brick having corrugated sides, these bands may be omitted.

Head—The head of the chimney shall be neatly corbeled out and fitted with a heavy annular retaining ring set in full bed of cement mortar.

Clean-out Door—Provide and place in base of chimney where directed by owner a cast iron clean-out door and frame properly hinged and fitted with latch. Said door to be approximately 24 in. wide by 36 in. high.

Ladder—Build on the interior of the chimney a ladder to consist of ¾-in. galvanized iron rungs, spaced approximately 15 in. center to center and securely anchored to the masonry from top to bottom. These ladder irons to be in the shape of a "U" with hooked ends.

Lightning Conductor—The lightning conductor is to consist of.....copper points, ¾ in. in diameter by 8 ft. long, with 1½-in. platinum tips. The points to be anchored to the top of the column and extend from the bottom of the corbeling upward. The lower ends of the points to be connected by a loop of copper cable encircling the chimney. From this loop there is to be 1½-in. 7-strand No. 10 Stubbs' wire gauge copper cable, carried down the side of the chimney and connected to copper ground plate of the 3-winged type as best for the proper distribution of charge. The points to be securely fastened to the top of the chimney and the cable to be anchored every 7 ft. in height with brass anchors, so designed that they will support the weight of the cable. The ground plate shall be buried by the contractor for the foundation when it is built.

Lettering (When Desired)—Work into the column on [one or two] sides as directed the letters [here insert the desired legend] to be made in permanently colored kiln burnt brick. Letters to be true to size and shape and to be in a true vertical line.

Trimings (If Any)—All necessary stone or terra cotta shown on drawing will be furnished without charge by the building contractor to the chimney contractor, who will set same. No one piece should weigh over 200 lbs.

Insurance—The chimney contractor shall carry at his own expense, during the entire period of construction, liability insurance, insuring the men in his employ and the public in general, in case of damage due to accidents.

Guarantee—The chimney contractor shall guarantee the chimney for a period of 5 years from date of completion. The guarantee shall cover any defects that may arise within this period due to faulty design, construction, material, weather, and the products of combustion up to 800° Fahr.; and shall further guarantee to make good at his own expense all defects that may arise from any of the above conditions within the specified period.

The chimney shall be designed for a wind velocity of not less than 100 miles per hour.

Note: The chimney shall be built according to THE M. W. KELLOGG COMPANY [or equal] system of construction.

HOOSIER STACK AND CONSTRUCTION CO.

GENERAL OFFICES

3323 East Washington Street
INDIANAPOLIS, IND.

BRANCH OFFICES

CINCINNATI, OHIO, 1758 Central Avenue
COLUMBUS, OHIO, 614 Commerce Building
SEATTLE, WASH., L. C. Smith Building
CHARLOTTE, N. C., 406 Commercial Bank Building

PITTSBURGH, PA., Chamber of Commerce Building
CLEVELAND, OHIO, 508 Leader-News Building
BOSTON, MASS., Board of Trade Building
FRAMINGHAM, MASS.

Products

Designers and builders of PERFORATED RADIAL BRICK and COMMON BRICK CHIMNEYS; PERFORATED RADIAL BRICK GRAIN ELEVATORS, SILOS and all types of STORAGE CONTAINERS.

Hazards Above the Roof

Money may be spent needlessly in the power plant, if the chimney is poor or cracked. Fuel saving devices do not do the trick then.

Think above the roof. Be sure always that the channel of draft is uninterrupted.

Hoosier Construction Insures Stack Service

Chimneys must be built right to "stand the gaff" of the elements. Better avoid the heavy expense of stack repair by utilizing Hoosier experience and engineering in your new chimney.

We are also equipped with special tackle and experts to inspect and repair old chimneys. Hundreds have found we save them money on this difficult service.

Service

Our long experience in stack construction has placed our engineering de-

partment in a position to give expert advice regarding the proper size of stack, proper design required, etc. Recommendations given on basis of actual experience. Specifications, plans, designs and data free on request.

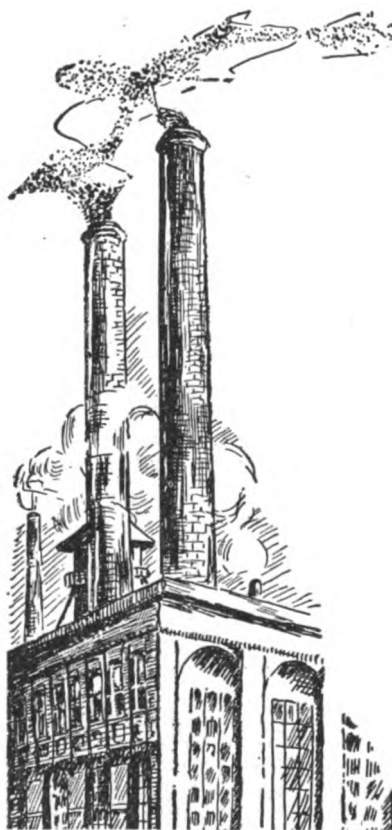
Only Best Brick Used

Our perforated radial brick are made only from the purest clays, selected for high refractory powers. Special attention is given to proper mix to produce resistance to heat stresses, as well as stresses from wind, and dead load weight.

Revolutionizing Construction of Radial Brick Chimneys

The Hoosier system of interlocking reinforcing ties consists of "U" shaped metal bars used for tying together and reinforcing masonry units, such as radial brick, hollow building tile, etc., which are used in the construction of smokestacks, elevators, silos and storage containers.

This class of radial brick construction can only be given you by the HOOSIER STACK AND CONSTRUCTION Co., who are the patentees of this method of construction.



HOOSIER CHIMNEYS

THE RUST ENGINEERING COMPANY

Engineers and Contractors

District Bank Building
WASHINGTON, D. C.

DISTRICT OFFICES
1901 Fifth Avenue
PITTSBURGH, PA.

Woodward Building
BIRMINGHAM, ALA.

BRANCHES OF WASHINGTON OFFICE

NEW YORK, N. Y., 140 Liberty Street
PHILADELPHIA, PA., 1009 Harrison Building
CHARLOTTE, N. C., 1100 Realty Building
BOSTON, MASS., 241 Franklin Street

BRANCHES OF PITTSBURGH OFFICE

CHICAGO, ILL., 115 South Dearborn Street
CLEVELAND, OHIO, Engineers Building
INDIANAPOLIS, IND., Merchants Bank Building
KANSAS CITY, MO., New England Building

Services

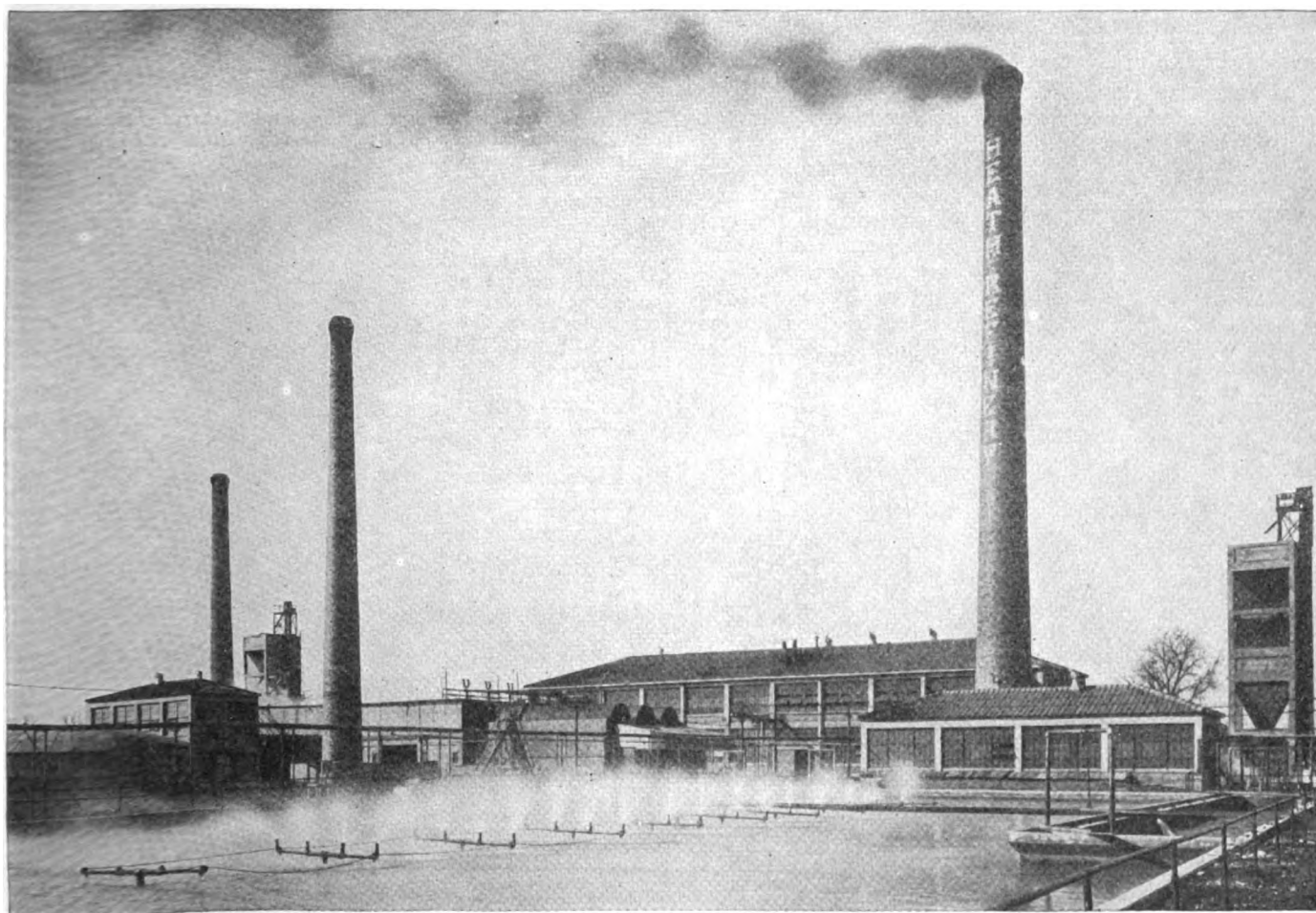
CONSTRUCTION of Industrial and Power Plants, Boiler Settings, Tanks, Reservoirs, Furnaces and Refractory Linings; all kinds of work involving the use of REINFORCED CONCRETE and BRICK.



RADIAL BRICK and REINFORCED CONCRETE CHIMNEYS.

Literature

Write for catalogues.



OIL REFINERY, PURE OIL COMPANY—HEATH REFINERY, NEWARK, OHIO

WM. SUMMERHAYS & SONS

Designers and Builders of Radial Brick Chimneys

1 Exchange Street

ROCHESTER, N. Y.

MONTREAL, CANADA, 109 Place D'Youville

Products

CHIMNEYS: Perforated Radial Brick and Common Brick.

BRICK BOILER SETTINGS, FURNACES and OVENS.

Sixty-five Years of Successful Chimney Building

Summerhays brick chimneys embody the results of 65 years of successful chimney building and have gained for WM. SUMMERHAYS & SONS an enviable reputation. Their present day practice is the cumulative experience of three generations.

Stability of design and quality of workmanship and materials explain the long life of their chimneys and the large number of successful installations in the United States and Canada.

This organization employs only workmen skilled in the chimney building trade—men who have specialized in this line of construction.

Summerhays chimney experts will, without charge, submit recommendations, plans, estimates, etc., for proposed radial and common brick chimneys and foundations, based on the knowledge gained through their long experience in chimney building.

Perforated Radial Brick—These brick are made from a selected shale material moulded from dies of this company's own design in varying sizes and radii, to make a perfectly bonded wall and to conform to the circumference of the chimney for any diameter. They are hard burned to the point of vitrification. The per-

forations insure an even and thorough burning of the entire brick, giving a material of maximum strength. The air pockets formed by these perforations, which are sealed with mortar, serve to insulate the hot flue gases from cooling by the atmosphere.

Typical Summerhays Chimneys—

Bausch & Lomb Optical Co.	Merrill Silk Co.
Berliner Gramophone Co., Limited	Mohawk Condensed Milk Co.—3
Buffalo, Rochester & Pittsburgh Ry.—2	National Carbon Co.—2
Canadian Connecticut Cotton Co.	New England Box Co.
Curtice Bros. Co.—3	New York Cannery—6
Curtiss Engineering Corp.	Oldsbury Electro Chemical Co.
Douglas Packing Co.—2	J. Hungerford Smith Co.—2
Great Atlantic & Pacific Tea Co.	Standard Oil Co.—3
Hamburg Canning Co.—3	Taylor Instrument Co.
International Salt Co.—2	United Gas Improvement Co.—3
Isco Chemical Co.	Vacuum Oil Co.—5
	Worcester Salt Co.—4
	Yawman & Erbe Mfg. Co.

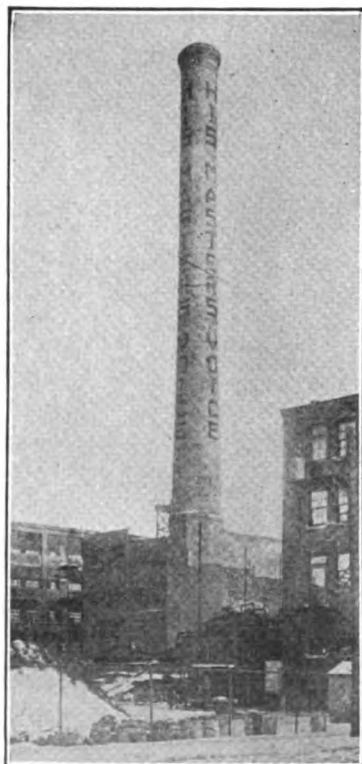
When Writing for Estimates—Give the following information:

Nearest railroad freight station and distance from railroad siding to chimney site; purpose for which chimney is to be used for maximum temperature likely to be encountered; dimensions of chimney required or total horsepower; type of fuel to be used; general arrangement of chimney and boiler layout together with data as to location of flue opening; local prices of sand, cement and red (common) brick.

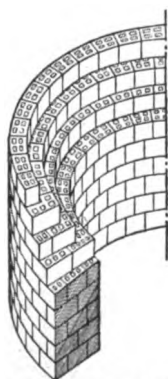
Brick Boiler Settings and Furnaces

The fire masonry experts of WM. SUMMERHAYS & SONS are in a position to design and build brick boiler settings, also ovens and special furnaces for any purpose.

From the standpoint of economy and efficiency, it is suggested that estimates for the construction of the chimney include construction of the boiler settings.

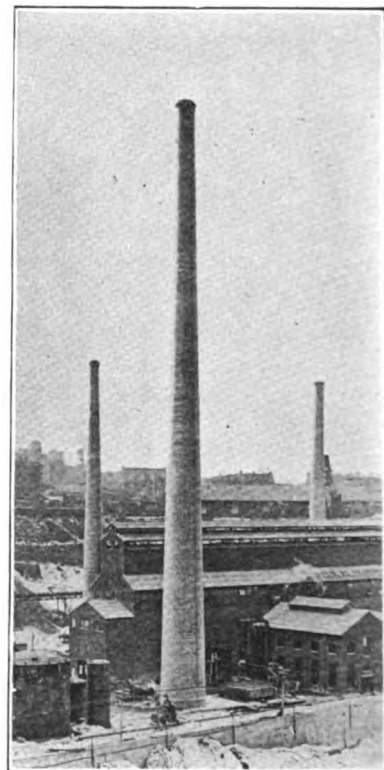


BERLINER GRAMOPHONE CO., LTD.,
MONTREAL, QUE.



HOW SUMMERHAYS
RADIAL BRICK
ARE BONDED

Wall bonding of Summerhays radial brickwork is accomplished by the use of brick of such varying lengths as to assure a thorough breaking of vertical and horizontal joints. This bonding is made every three courses.



ROCHESTER GAS & ELECTRIC CORPORATION, ROCHESTER, N. Y.

W. E. CALDWELL CO., INC.

Manufacturers of Tanks and Tank Towers

2240 Brook Street
LOUISVILLE, KY.

Products

WOOD, STEEL and GALVANIZED IRON TANKS; TANK FOUNDATIONS; TUBULAR, ANGLE or CHANNEL COLUMN and WOOD TOWERS; FRICTION CLUTCHES and PULLEYS.

Also manufacturers of Steel Stacks, Standpipes, Tank Agitators; Water Supply Systems; Gearing and General Power Transmission Machinery.

Industrial Tanks

Tanks for industrial and special purposes, in wood or steel—round, rectangular, elliptical, or any shape.

Wood—This company specializes in cypress, as it is the best wood for tanks for most purposes. It has great durability, minimum shrinking and swelling, and does not give taste or color to drinking water.

Fir, yellow pine, white pine, white cedar and poplar are also used.

Specifications—Lumber is thoroughly dried, without loose or unsound knots, splits, shake, peck or wormholes or other defects. All heart on inside, sound sap on outside only, not to exceed one-half the thickness.

Thickness—2 in. for 10,000 gals. and smaller, 2½ in. up to 20,000 gals.; 3 in. for larger sizes. Finished thicknesses are 1¾, 2¼ and 2¾ in., respectively.

Standard Inside Diameter—Every 6 in. from 3 ft. to 9 ft., every foot to 16 ft., and every 2 ft. above 16 ft.

Standard Inside Depth—1 ft. 5 in.; 2 ft.; 2 ft. 5 in.; 3 ft.; 3 ft. 5 in.; 4 ft.; 4 ft. 5 in.; 5 ft.; 5 ft. 5 in.; 6 ft.; 6 ft. 5 in.; 7 ft. 5 in.; 9 ft. 5 in.; 11 ft. 5 in.; 13 ft. 5 in.; 15 ft. 4 in.; 17 ft. 4 in.; 19 ft. 4 in.; 21 ft. 4 in.; 23 ft. 4 in.

DIMENSIONS AND CAPACITIES OF STANDARD TOWER TANKS

Class towers*	Capacity, gals.	Standard Wood Tanks		Standard Steel or Galvanized Tanks	
		Diameter ft. in.	Depth ft. in.	Diameter ft. in.	Depth ft. in.
O tubular.....	1,000	6 6	4 5	6 0	5 0
or CC angle.....	1,500	6 6	6 5	6 6	6 6
A tubular.....	2,800	8 0	7 5		
or FF angle.....	3,000	8 0	8 5	8 0	8 0
B tubular.....	5,000	10 0	9 5		
or HH angle.....	6,000	10 0	11 5	10 0	10 0
C tubular.....	10,000	12 6	11 5	12 0	12 0
or JJ angle.....	12,000	12 6	13 5		
D tubular.....	15,000	14 0	13 5	14 0	14 0
or KK angle or LD latticed	17,000	14 0	15 5		
E tubular.....	20,000	16 0	13 5	16 0	14 0
or LL angle or LD latticed	22,000	16 0	15 5		
ESTubular or LES latticed	25,000	16 0	17 4	16 0	18 0
F tubular.....	30,000	18 0	15 4	18 0	18 0
or LF latticed.....	33,000	18 0	17 4		
FSTubular or LFS latticed	35,000	18 0	19 4	18 0	20 0
G tubular.....	36,000	19 6	17 4		
or LG latticed.....	40,000	19 6	19 4	20 0	18 0
LH latticed.....	50,000	22 0	17 4	22 0	18 0
	55,000	22 0	19 4	22 0	20 0

*Hemispherical bottom steel tanks and towers are regularly made in capacities from 10,000 gals. up. Any of the above towers can be made to suit special conditions.

Workmanship—Staves dressed both sides. Edges machine jointed to proper bevel. Bottom dressed on top side only. Machine jointed straight and square and well doweled.

THE TANK WITH
A REPUTATION
Caldwell
TANKS
AND
TOWERS
TRADE-MARK



WOOD TANKS

Hoops—Round hoops of wrought iron (not steel) with malleable iron draw lugs; sizes and spacing to give a safety factor of 4 to 1.

Steel—Thin galvanized tanks are recommended only in small sizes and for intermittent or temporary use.

Heavy steel tanks made in any shape or size.

Specifications—The standard diameters and depths are in even feet. The standard thicknesses are ¼ in. up to and including 10 ft.; ⅜ in. up to 16 ft.; ½ in. up to 24 ft., and ⅝ in. above 24 ft. in diam.

These can be furnished set up, in the smaller sizes, or knocked down, all punched, fitted and bent to shape with the necessary rivets.

Tank Foundations

Plans for foundations on the ground will be furnished. Designs of, and prices on, foundations for special conditions will be submitted on receipt of a sketch with the necessary rivets.

Tank Towers

Tubular Column—Classes O to G built with tubular steel columns and struts, in heights of 15 ft. and every 12-ft. interval above to 100 ft.

Angle Column—Classes CC to LL built with steel angles for columns and struts, in heights of 12 ft. and every 10-ft. interval above to 102 ft.

Latticed Column—Classes LD to LH built with latticed steel channel columns and struts (bridge construction), in heights of 20 ft. and every 5 ft. above to any height.

Note: Above types of towers are for flat bottom tanks (see table) and are furnished with either a steel or wood foundation for the tank at the top.

Hemispherical All-steel Tanks and Towers—Made with latticed columns and struts in all capacities and heights.



TANK AND TOWER,
STUDEBAKER BROS.
MFG. CO.,
SOUTH BEND, IND.
150,000 gals., 206 ft. high

Caldwell Friction Clutch

The basic principle of this clutch is identical with that of the standard automobile service brake, a flexible band lined with Rabestos and tightened with a single lever. There are only eleven parts. One screw adjusts it, shortening or lengthening the band which gives equal pressure everywhere around the friction ring.



CALDWELL
FRICTION CLUTCH
PULLEY

ESTABLISHED 1870

CHALLENGE COMPANY

182 River Street

BATAVIA, ILL.

BRANCHES

KANSAS CITY, MO.

OMAHA, NEBR.

MINNEAPOLIS, MINN.

DALLAS, TEX.

Products

WOOD TANKS: Round, Half Round, Rectangular and Oval of any capacity.

SPECIAL TANKS and VATS for any purpose supplied on specifications.

STEEL TANK TOWERS for elevating tanks any height.

Also manufacturers of Gasoline and Kerosene Engines; Windmills of all sizes for pumping purposes; Pumps, Hand and Power.

Wood Tanks

Challenge tanks have been manufactured by us for the past 50 years and we have learned by actual experience how to serve the trade with the best that can be produced in the line of tanks, vats, etc. They are made of thoroughly seasoned, clear Oregon fir, Louisiana red gulf cypress or redwood, by men especially trained in tank building with modern tank-making machinery.



WOOD TANK

iron hoops, provided with lugs for tightening.

Specifications solicited, and we will be pleased to submit prices, etc.



RAILROAD WATER STATION

Railroad Water Stations

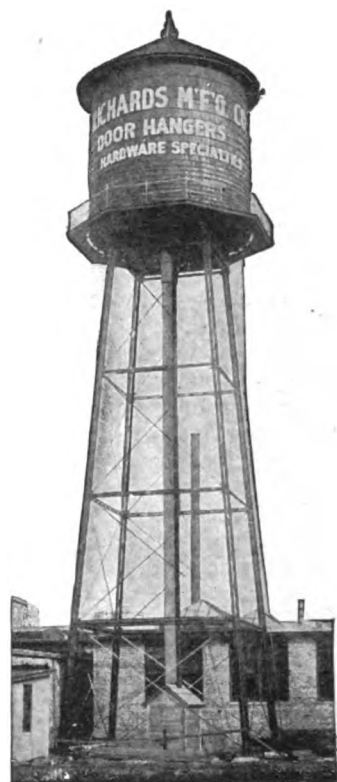
We are in a position to furnish complete outfits consisting of tank of any size, tower and fixtures, f. o. b. cars at our factory or erected complete at any point in the United States or Canada. Send the specifications.

Sprinkler Tanks and Towers

Sprinkler tanks and towers are used in connection with automatic sprinkler systems for fire protection. The increasing demand for these outfits has made it necessary for the factory mutual insurance companies, fire underwriters and stock companies to demand a tank built to suit the requirements, especially for safety.

Any size manufactured, according to insurance requirements; of cypress, fir or redwood, and provided with round iron hoops and lugs of proper sizes.

Towers can be furnished any height on which these tanks can be placed and prices will be quoted on complete outfit delivered and erected.



SPRINKLER TANK AND TOWER

Wood Vats

The accompanying illustration shows a plain rectangular tank such as we build hundreds of every year. Any size or style manufactured to specifications. All details of their construction, selection of material, etc., are in the hands of expert tank makers that have had years of experience. The ends are crozed into the sides and thoroughly rodded in every direction to prevent warping, splitting or leaking.



WOOD VAT

ESTABLISHED 1865

A. J. CORCORAN, INC.**Manufacturers of Tanks, Towers, Pumps and Windmills**

OFFICE

766 Jersey Avenue

JERSEY CITY, N. J.

WORKS: JERSEY CITY, N. J., Jersey Avenue and 13th Street—Telephone, Montgomery 238

Products

Manufacturers of "CORCORAN" TANKS which include: Ink and Blacking Tanks; Tanks for Acids and Chemicals; Rectangular and Oval Tanks; Frostproof Tanks; Sprinkler Tanks; Developing Tanks; Dye Tubs; Vats; Tumbling Barrels; Drums; Tanks for Special Purposes.

Also, machinery made and fitted in tanks, including Manhole and Handhole Frames and Covers to order.

Agitators for Wooden Tanks; Windmills; Towers; Pumps; Engines.

Experience and Prestige

Over fifty years of practical experience in the manufacture and erection of tanks and windmills have made this house an authority on the essentials that tanks and windmills should possess for general utility.

Acid Tanks

A. J. CORCORAN, INC., were pioneers in constructing acid tanks and are among the leaders in this important industry. Tanks of this kind are made of extra heavy

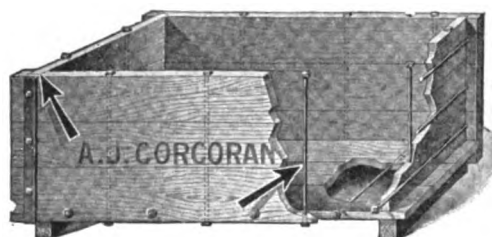
6-, 8- and 10-in. yellow pine, dressed so as to resist the corrosive influences of acids and other chemicals. They have replaced lead lined tanks, because they last longer and cost less.

The Corcoran factory is equipped for making all types of acid tanks, and special tools and fittings have been installed for making rectangular acid tanks in the best manner and by the most improved methods.

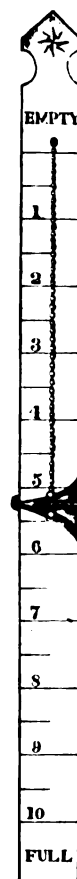
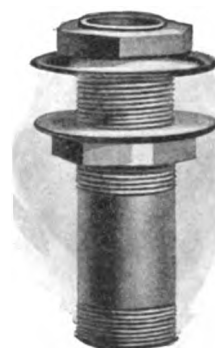
Advantages

All Corcoran tanks are warranted to be absolutely watertight; and while the initial cost may be slightly higher than numerous unknown tanks, they are always cheaper in the end.

Corcoran tanks are indorsed by the New York Building and Fire Departments, Fire Insurance Exchange and the Associated Factory Mutual Fire Insurance Companies.

GRAVITY OR SPRINKLER TANK
FOR FACTORIES

ACID OR CHEMICAL TANK

CORCORAN
STANDARD
TANK
GAUGETANK FOR VIL-
LAGE WATER
WORKSCORCORAN FROSTPROOF
TANKCORCORAN WATER TOWER FOR
COUNTRY ESTATEFOR CONNECTING PIPES
TO TANK

HAUSER-STANDER TANK CO.

Spring Grove Avenue and Ammen Street, Winton Place
CINCINNATI, OHIO

Products

HAUSER-STANDER WOOD
TANKS, VATS, TUBS and
DRUMS.

Quality of Products

For 50 years, the HAUSER-STANDER TANK Co. has been building wooden tanks for all purposes, its products being used in all parts of the world. During this period we have developed and improved our construction and offer wooden tanks perfect in every detail. All lumber is thoroughly air seasoned, and each tank is made mechanically correct.

Slogan

We Win with Quality.

Liberal Guarantee

The Hauser-Stander products are guaranteed as specified.

If products do not meet with every claim made, they can be returned at our expense and we will promptly replace or refund money, together with freight charges that may have been paid by the purchaser.

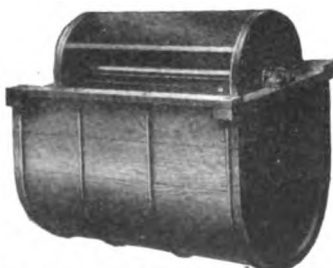


40,000-GAL. LOUISIANA RED
CYPRESS TANK

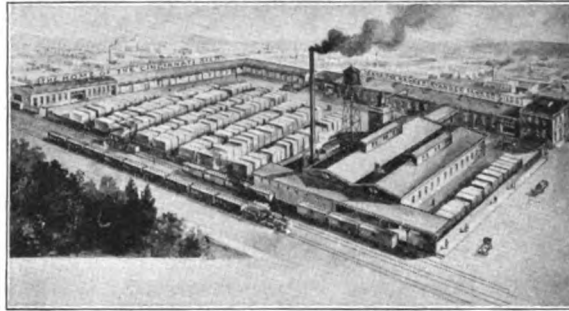
Water Supply and Sprinkler Tanks

Made of best grades of Louisiana red cypress (the wood eternal) or Oregon fir, in accordance with the specifications of the National Board of Fire Underwriters. Also water tanks for private systems.

Furnished with frost-proof conical or flat roofs and with outside iron or inside wood ladders, hatch covers, etc.



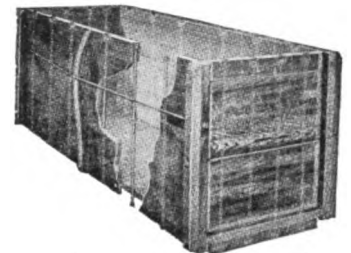
TANNERS' VAT WITH PADDLE
WHEEL



PLANT OF HAUSER-STANDER TANK CO.

Rectangular Tanks

Rectangular tanks of any size, plain or lead lined for chemical, acid and film manufacturers, dye and color works, photographers, electrotypers, galvanizers, textile mills, etchers, foundries, etc. Built of genuine Louisiana red cypress, long leaf yellow pine, or Oregon fir. They will not bulge nor warp.



RECTANGULAR TANK

Round Tanks

Made in any size from 100 to 100,000 gals. capacity, of genuine Louisiana red gulf cypress, yellow poplar, Southern long leaf yellow pine, quartered or plain white oak, Northern white pine, and Oregon fir.



ROUND TANK

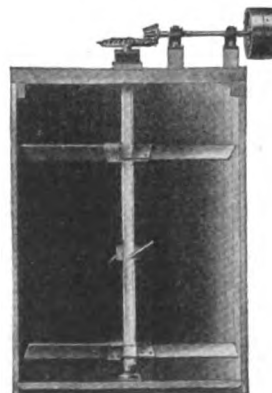
Double Headed Tanks

Double headed tanks, with or without taper, with or without bilge, will be built according to purchaser's specifications.

Special Tanks Built to Purchaser's Specification

We make all tanks for customer's special requirements. No stock goods carried.

If in doubt, submit tank problem to our tank experts for satisfactory solution.



SINGLE HEADED AGITATOR
TANK



PRESSURE TANK

ORGANIZED 1867

INCORPORATED 1889

KALAMAZOO TANK & SILO CO.

KALAMAZOO, MICH.

Products

WOOD TANKS for all purposes, including Storage Tanks, Railroad Tanks, Manufacturing Tanks, Paper and Pulp Mill Tanks, Blow Pits, etc.; STEEL TOWERS; TANNERS' DRUMS, VAT TRUCKS.

Also manufacturers of Special Tanks, Wood Vats, Agitators, Vinegar Generators, Frostproofing for Pipes.

Services

This company maintains a staff of engineers whose experiences in the manufacture of tanks and tank structures cover a period of many years. They have acquired valuable information for the solution of all tank problems, which they will gladly furnish to prospective buyers.

Special Construction

We have a competent force of constructors or erectors, for building large wooden tanks such as those used in paper and pulp mills, etc., or for erecting a battery of smaller tanks in any industry.

Round Wood Tanks

Tank staves accurately sawed and jointed on true and radial lines, with proper regard for diameter of tank. The crozing at bottom of stave is cut circular with proper regard to stave when set in position and assures same to be completely filled by tank bottom when staves are driven up. Outside surfaces of staves finished convex, giving full bearing to hoop over entire face of stave. Tanks furnished with correct number of round steel hoops and malleable iron lugs for tightening.

Size of tank determines hoopage, and factor of safety allowed to make ample allowance for pressure of water, and swelling of staves.

Rectangular Wood Tanks

Carefully machined and jointed in workmanlike manner. Built in any size required, with or without partitions, false bottoms, etc. The vertical rodding runs through the lumber and tops of rods are countersunk and covered with rounded piece of maple wood, giving smooth and finished top. Shipped knocked down, all pieces match marked for easy assembly, or shipped set up if convenient or required.

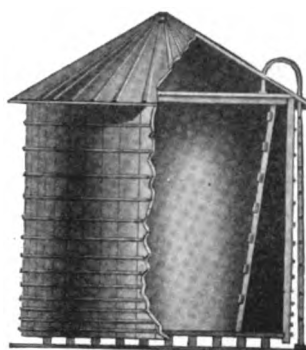
Gravity Wood Tanks

Furnished with or without steel towers and are suitable for supply or sprinkler systems. They can be furnished complete with pitched or flat roof, ladders, indicator and float.

Built to requirements of National Board of Fire Underwriters and local authorities.



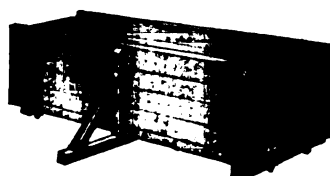
ROUND WOOD TANK

ELEVATED STORAGE
RAILROAD TANKGRAVITY TANK
Finial ornament omitted

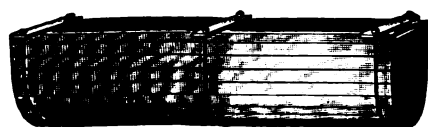
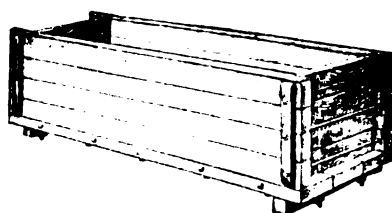
VAT TRUCK



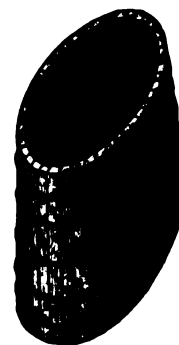
TANKS AND TOWER



TANK WITH OUTSIDE BRACE

HALF ROUND TANK
Open top with brace

RECTANGULAR TANK

TANNERS' DRUM
Driven with chain and
sprocketELLIPTICAL
TANK
All sizes

U. S. WIND ENGINE & PUMP CO.

Engineers, Contractors, Manufacturers

23 Water Street
BATAVIA, ILL.

Products

A complete line of WOOD TANKS for all purposes; STEEL TANK STRUCTURES for Wood and Steel Tanks; SWITCH STANDS and SEMAPHORES; WINDMILLS.

COMPLETE LOCOMOTIVE WATERING PLANTS, including TELESCOPIC WATER COLUMNS and all other necessary devices, are furnished and will also be installed.

Also Hand Pumps, Well Cylinders, Check Valves, Strainers and other Well Accessories.

Water Works and Other Products

Water works installed complete, for all purposes.

Water works are adapted for efficient service that will meet all requirements of towns, factories, railroads, public and private institutions, residences, etc. The following are several productions, built for various lines of duty:

Wood Tanks—For any purpose. Quotations given on any kind of material, size or shape, according to specifications.

Steel Tank Structures—For elevating tanks. Made and shipped in any combination either f. o. b. cars or erected complete.

Tank Hoops—Round, flat, half round.

Windmills—Steel and wood, for pumping water. All sizes for different duties.

Hand Pumps—50 different kinds, for all requirements.

Curtis Pumps—Double acting, brass lined, for shallow wells.

Railroad Water Stations—These include outlet fixtures, water columns and pumping machinery, all made and shipped f. o. b. cars, or erected complete.

The railroad water columns are made adjustable, or with rigid spout. The outlet fixtures and valves are made in all styles, for wood or steel tanks.

The pumping machinery consists of a full line of well supplies and equipment for every condition.

Switch Stands and Semaphores—Built for hard service. The strongest on the market.

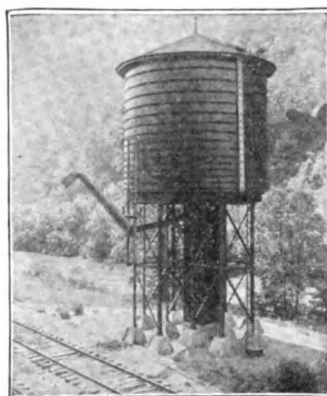
Three-inch Storage Tank

Specifications—The tank to be made with straight sides and all planks to be full length without splicing unless otherwise specified. Staves to be convex on the outside and joints sawed on true radial lines, with due regard to the circumference of this particular tank; thus insuring a perfect fitting joint without the uncertainty of hand jointing necessary with a so-called planed joint where all four sides are surfaced in one operation on a "sticker."

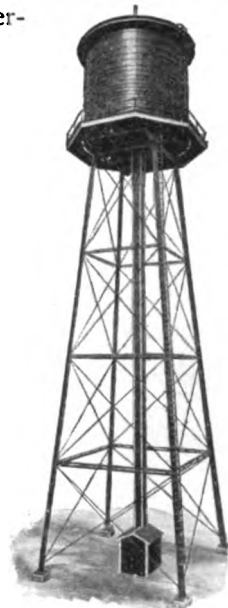
Each edge to be accurately machine-sawed separately, to a perfect joint for its entire length. By this method all defective edges can be eliminated because the width of the stave can be gauged to correspond with the sound material in each plank, rather than running all planks through the "sticker," regardless of tank dimensions, or qualities of lumber.

The crozing at bottom of staves to be cut circular in shape to fit the exact circumference of the tank bottom for which it is intended and to be completely filled when the stave is well driven on the bottom.

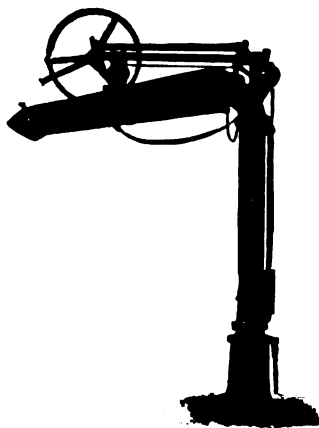
The tank to be provided with the proper number of "iron" hoops with draw lugs for tightening. Round hoops are sent formed to the circle of the tank. The location of the hoops to be plainly marked on several staves, which may be placed at intervals around the tank.



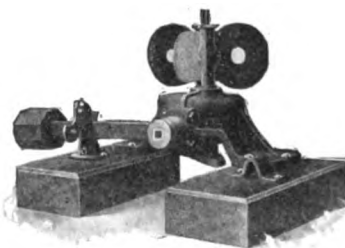
RAILROAD TANK AND STRUCTURE



TYPICAL TANK AND STRUCTURE



TELESCOPIC WATER COLUMN



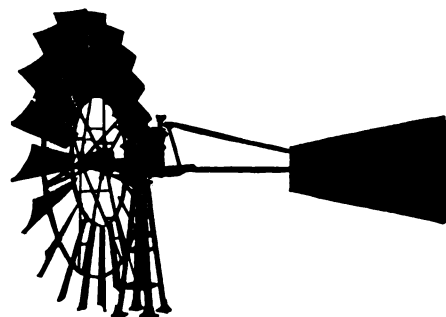
SWITCH STAND

Special Designs

Special designs of apparatus are manufactured to meet all demands of water works service.

Estimates and Co-operative Service

Upon receipt of full information as to needs and conditions of water service to be installed, free advice and estimates will be furnished.



WINDMILL

G. WOOLFORD WOOD TANK MANUFACTURING COMPANY

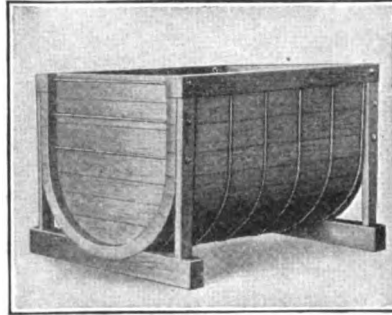
ESTABLISHED 1854

OFFICE
Lincoln Building
PHILADELPHIA, PA.

FACTORY: DARBY, PA.

Products

WOOD TANKS of all types and sizes for all purposes, including: Railroad Water Supply and Water Softener Tanks, Railroad Tank Cars, Acid and Fume Towers, Tanners' Drums, Crescent Tubs, Vats, etc., Pickling Tanks, Acid Storage for Paper Mills, Acid Tanks, lined or unlined.



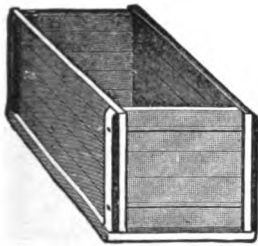
PICKLING TANK
For galvanizing wire in coils

Material

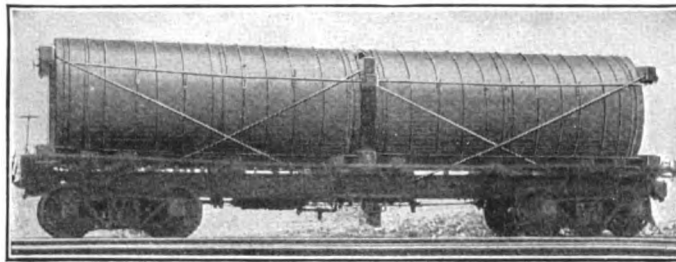
Cypress, cedar, fir, white and yellow pine and maple.

Service

Modern plant; electrically driven machinery; no tank too large or intricate.



RECTANGULAR TANK
For dyeing, bleaching, photo developing. Built in stock 1½ to 4 in., any size



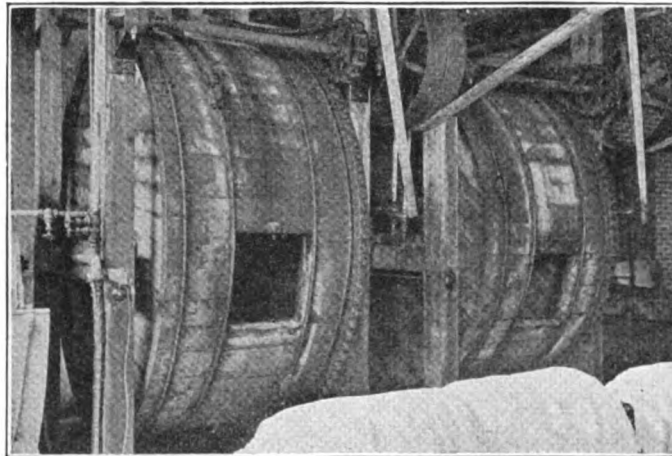
RAILROAD TANKS
In one or two compartments, used in transporting tanners' liquors, acids, oils or chemicals



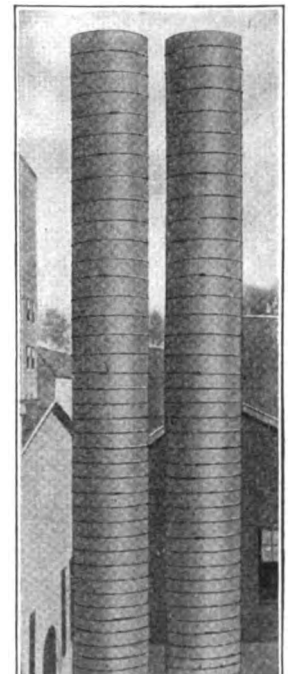
ROUND TANKS
From 100 gals. up for storage and sprinkler purposes



RAILROAD STORAGE TANK
100,000 gals. Made of cypress, fir, cedar, yellow pine. Storage or sprinkler tanks in capacities up to 100,000 gals.



TANNERS' DRUMS
Operated by the Roth drive, effects saving of one-third power. Used also for mixing heavy chemicals. Gear and chain driven drums and tumblers for washing, dry milling, mixing, scouring and polishing. Manufactured in any size



ACID OR FUME TOWERS
For paper mills and refineries. Any desired height

THE BIGGS BOILER WORKS COMPANY

Steel Pressure and Storage Tanks

East Market Street and Case Avenue
AKRON, OHIO

ESTABLISHED 1887

Products

STEEL TANKS of every description including PNEUMATIC WATER SUPPLY, HOT WATER STORAGE, GASOLINE and OIL STORAGE, etc.; AIR RECEIVERS.

Also Steel Plate Construction of every description including Jacketed Tanks and Kettles; Heaters: Feed Water, Mechanical Hot Blast, Oil, Refinery, Road Oil (Auto), Sugar Juice and Pipe Coil Air Heaters; Flumes; Penstocks; Riveted Steel Pipe; Smokestacks; Pans; Lathe, Shop and Vacuum; Door Saddles; Stills; Chemical and Oil Refinery; Retorts; Oil Refinery Condensers; Glue Mixers; Agitators; Oil Separators.

Lubricating Oil Filtering, Circulating and Reclaiming Systems; Dry Cleaners' Naphtha Storage and Distributing Systems.

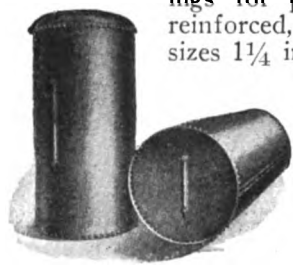
For Vulcanizers and Devulcanizers, see page 850.

Plant

Plant hydraulically equipped—capacity, 1½-in. steel plate.

Pneumatic Water Supply Tanks

Recommended and guaranteed for a safe daily working pressure of 75 lbs. Materials and workmanship are the best. Rivets are closely spaced and are hydraulically driven. Heads are flanged and dished under hydraulic pressure of 300 tons in formers which are accurately machined. Water gauge openings are tapped automatically by a special machine. Openings for pipe connection are properly reinforced, using forged steel flanges on sizes 1¼ in. in diameter and larger.



PNEUMATIC WATER SUPPLY
TANKS

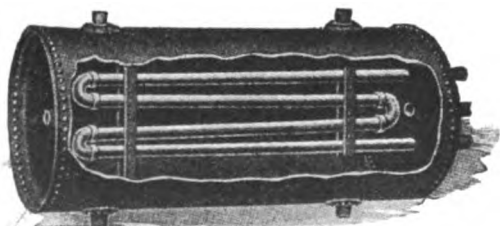
Thoroughly inspected during construction, and upon completion are subjected to a hydrostatic test pressure of 50% in excess of the safe daily working pressure. Absolutely airtight.

Price lists furnished on application.

Extra Heavy Hot Water Storage Tanks

Made with or without coils. Standard coils are made of four pipes connected with three return bends. They are securely fastened to the tank and properly braced. Can be equipped with special coils if desired.

Price lists furnished on application.



EXTRA HEAVY HOT WATER STORAGE TANK FOR 100 LBS.
PRESSURE

Extra Heavy Oil and Gasoline Storage Tanks

Constructed according to specifications of the National Board of Fire Underwriters and, if desired, will be furnished with underwriters' label attached at no additional charge. Suitable for the storage of gas, fuel oil, kerosene, gasoline, naphtha, etc. An absolutely tight joint is assured under all conditions, all rivets being closely spaced and driven hot under hydraulic pressure. All seams lap joint single riveted, properly laid up and calked metal to metal without composition filler.

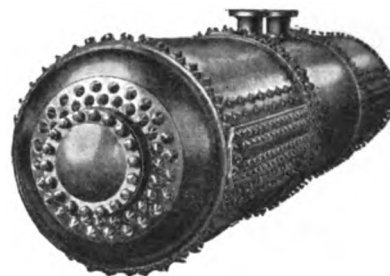
Standard sizes of oil and gasoline storage tanks are carried in stock. Price lists covering 166 standard sizes furnished on application.



EXTRA HEAVY GASOLINE STORAGE TANK
Capacity, 84 gals. to 25,000 gals.

High Pressure Tanks

We are specialists in high pressure tank construction. The tank illustrated is designed for 500 lbs. working pressure, and is used largely by compression and absorption gasoline plants. Shell plates are 1½ in. thick. Rivets are 1⅝ in. in diameter, with longitudinal seams butt joint, quadruple staggered riveted with inside and outside covering strap.



HIGH PRESSURE TANK

Air Receivers

Furnished for any working pressure. Construction and selection of materials receive the utmost care. Tested to 50% in excess of guaranteed safe working pressure. Rivets hydraulically driven. Heads flanged and dished to true radius of diameter of shell. Openings reinforced with forged steel flanges.

Horizontal receivers with man-head have both heads riveted in convex. Manhead is always placed in head near drain opening, unless otherwise specified.

Vertical receivers with man-heads have bottom head concave and manhead is located in shell on line with outlet near bottom, unless otherwise specified.

Standard air receivers have longitudinal seams lap joint, double staggered riveted; circular seams, single riveted. Price list furnished on application.



AIR RECEIVER

CHICAGO BRIDGE & IRON WORKS

ESTABLISHED BY HORACE E. HORTON IN 1865

Designers, Manufacturers and Constructors of Steel Tanks, Self-supporting Steel Stacks and All Classes of Plate Metal Work

OFFICES

CHICAGO, ILL., 2022 Transportation Building
NEW YORK, N. Y., 3135 Hudson Terminal Building
DALLAS, TEX., 1623 Pretorian Building
ATLANTA, GA., 1011 Forsyth Building

SAN FRANCISCO, CAL., 1074 Rialto Building
SEATTLE, WASH., L. C. Smith Building
BRIDGEBURG, ONT., CAN., 161 Janet Street
MONTREAL, QUE., CAN., 1024 Bank of Toronto Building

EASTERN PLANT: GREENVILLE, PA.

CENTRAL PLANT: CHICAGO, ILL.

CANADIAN PLANT: BRIDGEBURG, ONT., CAN., HORTON STEEL WORKS, LTD.

Products

ELEVATED STEEL WATER TANKS, STORAGE TANKS, STAND PIPES, RAILWAY TANKS, SELF-SUPPORTING STACKS, ACID TANKS, OIL TANKS of all kinds.

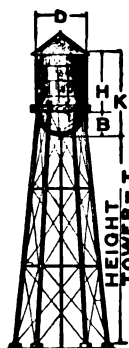
Also manufacturers of Paper, Pulp, Sugar, and Oil Mill Equipment, Coaling Stations and all classes of Heavy Plate Metal Work.

ELLIPTICAL AND HEMISPHERICAL BOTTOM ELEVATED TANKS

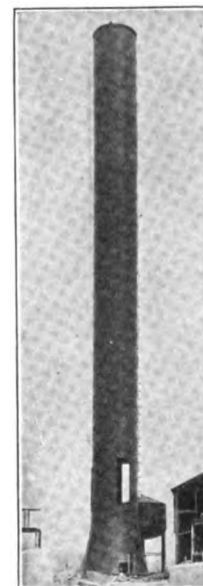
Capacity, gals.	Elliptical bottom, ft., in.			Hemispherical bottom, ft., in.		
	D	H	K	D	H	K
15,000	15 0	9 0	12 9	12 0	14 0	18 6
20,000	16 0	11 0	15 0	12 9	17 3	22 1½
25,000	17 6	11 0	15 4	14 1	17 3	22 9½
30,000	18 6	12 0	16 7	15 3	17 3	23 4½
35,000	19 0	13 4	18 1	16 4	17 3	23 11
40,000	20 0	13 9	18 9	17 4	17 3	24 5
50,000	22 0	14 0	19 6	19 0	17 6	25 6
60,000	24 0	14 0	20 0	19 0	22 3	30 3
70,000	25 0	15 0	21 3	21 0	20 3	29 3
75,000	26 0	15 0	21 6	22 0	19 4	28 10
80,000	26 0	16 0	22 6	22 0	21 1	30 7
100,000	28 8	16 0	23 2	22 0	28 0	37 6
125,000	28 8	21 2	28 4	24 0	29 0	39 6
150,000	34 0	16 6	25 0	26 0	29 3	40 9
200,000	38 0	17 6	27 0	28 0	34 6	47 0
250,000	40 0	20 0	30 0	30 0	37 2	50 8
300,000	41 0	23 9	34 0	32 0	40 0	54 6
400,000	47 0	23 2	34 11	35 0	44 0	60 0
500,000	51 0	24 3	37 0	38 0	46 6	64 0

Dimensions of our Standard Tanks:

Elliptical.	Depth of bottom $B = \frac{D}{4}$
	Square of base $= .71D + .118(T+B)$
Hemispherical.	Depth of bottom $B = \frac{D}{2}$
	Square of base $= .71D + .162(T+B)$



TANK FOR PROCTER & GAMBLE, HAMILTON, ONT.
Capacities, 50,000 and 100,000 gal. Heights, 100 and 50 ft. to bottom



STEEL STACK, UNITED VERDE COPPER CO., JEROME, ARIZ.
Diameter, 31 ft.; height, 400 ft.

Information Required in Making Quotations on Elevated Water Tanks

- (1) Capacity of tank required in gallons.
- (2) Height of tower, which should be given to the lowest point of bottom of tank above top of foundations.
- (3) If tank is used for sprinkler service, state whether stock company or mutual.
- (4) Which, if any, of the following accessories manufacturer is to furnish: riser pipe, frost casing, overflow, indicator, pressure gage, tank heater, heater house, foot elbow, gate valve, float valve. None of these accessories is included in quotations except when expressly so stated.

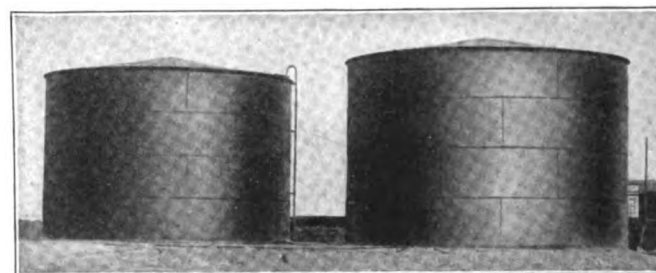
STANDARD SIZES CYLINDRICAL VERTICAL STORAGE TANKS

Capacity, gals.	Diam., ft. in.	Height, ft. in.	Capacity, gals.	Diam., ft. in.	Height, ft. in.	Capacity, gals.	Diam., ft. in.	Height, ft. in.
10,000	12 3	11 9	75,000	23 9	23 3	225,000	36 6	29 0
15,000	15 0	11 9	90,000	26 0	23 3	250,000	38 6	29 0
20,000	17 4	11 9	100,000	27 4	23 3	300,000	42 0	29 0
25,000	16 0	17 6	120,000	30 0	23 3	400,000	49 0	29 0
30,000	17 4	17 6	125,000	27 6	29 0	500,000	54 3	29 0
40,000	20 0	17 6	150,000	30 0	29 0	600,000	60 0	29 0
50,000	22 4	17 6	175,000	32 3	29 0	750,000	66 3	29 0
60,000	21 3	23 3	200,000	34 6	29 0	1,000,000	77 0	29 0

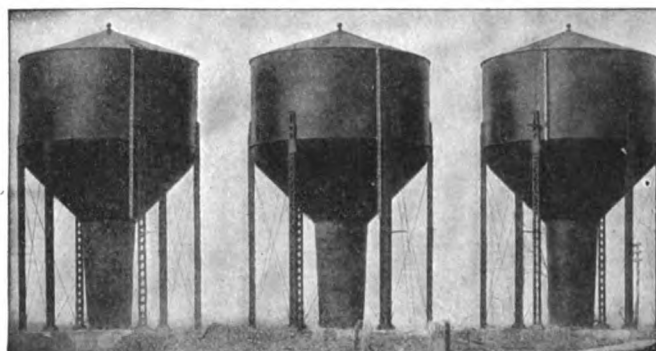
Catalogue

Catalogue No. 50 mailed on request.

SWEET'S CATALOGUE



MOLASSES TANKS, GREAT WESTERN SUGAR CO., GERING, NEBR.
Diameter, 35 ft.; height, 23 ft.



150,000-GAL. CONICAL-BOTTOM TANKS, CHICAGO & NORTH WESTERN RY., CHICAGO TERMINAL

GEO. E. CORBETT BOILER & TANK CO.

Steel Plate Construction

TELEPHONES
LINCOLN 9105, 9106, 9107

1332-1336 Cortland Street
CHICAGO, ILL.

Products and Services

STEEL PLATE CONSTRUCTION, made with riveted or welded seams, shipped knocked down, or erected in any part of the country, per plans and specifications, including: Agitators; Air Receivers; Bins for the storage of Ore, Grain, Coal, Chemicals, etc.; Buckets, self-dumping, tar, etc.; Chutes; Coolers; Digesters; Drums; Dryers; Horizontal or Vertical; Evaporators; Flumes; Grinders; Hoppers, coal, ash, powder, grain, etc.; Kettles, open or jacketed; Ladles; Mixers; Pans of all kinds; Penstocks; Pipe; Reclaimers; Retorts; Separators; Tubs; Vats.

STEEL TANKS of all kinds and for every purpose.

Also Standard Boiler and Conveying Equipment fabricated and erected for the following plants: Packing Plants; Rendering and Fertilizer Plants; Powder Plants; Acid Works; Paper Mills; Oil Refineries; Wood Alcohol and Turpentine Plants; Chemical Works; Soap Factories; Paint and Varnish Works; Sugar Refineries; By-product Plants; Garbage Reduction Plants; Coke Oven

Plants and for any industry using or having articles manufactured of steel plate.

Boilers, horizontal or vertical; Breechings; Burners for Garbage and Refuse; Boiler and Tank Heads, etc.

REPAIR WORK specialized in: Steam Heat, Pressure, Hot Water, Oil and Gas Boilers; Hot Water Heaters Garbage Burners and Tanks. We carry repair parts: grates, fronts, castings, tubes, etc., for any boiler.

Engineering Service and Facilities

A complete Engineering Department and fabricating shop are maintained, equipped to construct large plate work designed for industrial plants in any section of the country. Equipment built direct from specifications.

Complete portable electric welding and oxygen-acetylene welding equipments; also pneumatic and electrical riveting equipments shipped anywhere with erecting gangs.

A few illustrations of our standard line of steel plate construction are shown.



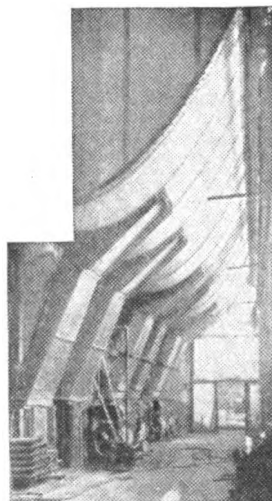
SELF-SUPPORTING
STEEL STACK



VERTICAL REN-
DERING TANK



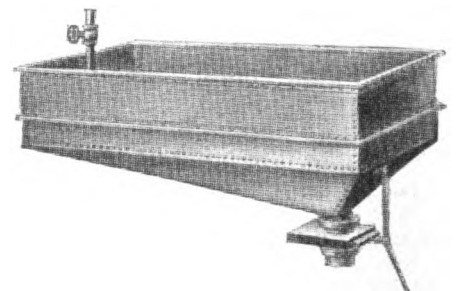
RIVETED FLUE ELBOW
Also made welded



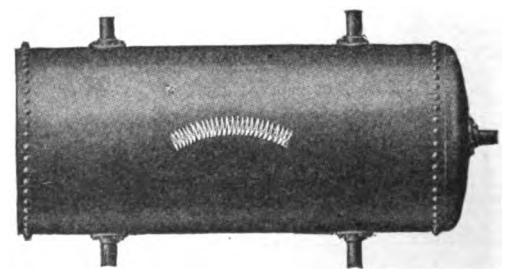
GRAIN OR COAL HOPPER



RIVETED SMOKE BREECHING
Also made welded



ORDINARY TANK WITH CAST IRON
CONNECTION



RIVETED AIR OR HOT WATER TANK
Also made welded

GRAVER CORPORATION

Steel Tanks and General Steel Plate Construction

EAST CHICAGO, IND.

CHICAGO OFFICE, 1412 Steger Building

Products

The Graver line includes all varieties of STEEL TANK and STEEL PLATE WORK, from a 550-gal. Welded Tank to an 80,000-barrel Tank, or complete Refinery Equipment, including Stills, Condenser Boxes, Agitators, Filters, Bleacher Tanks, Towers, etc.

ELEVATED TANKS and TANKS on TOWERS.

For Water Softeners, see page 245.

Range of Products and Facilities

Our economical standard designs and sizes will fit most cases. But we are prepared to build and erect according to any special design or individual specification. Our plant is ideally located in a celebrated steel center; shop equipment includes the best for efficient production, and our facilities for quick shipment are unexcelled.

Tower Tanks

We are prepared to build tanks on towers for all purposes. These include railroad and industrial installations.

Special Storage Tanks

In certain industries, because of the character of the liquid to be stored, tanks must be specially constructed. Among these industries and their requirements are the following:

Sugar industry—molasses storage tanks.

Chemical industry—acid storage tanks.

Asphalt industry—heavy oil storage tanks.

Mining industry—solution tanks.

Tanks used for the above purposes, because of weight of the liquid or because of its destructive action on steel, must be constructed of



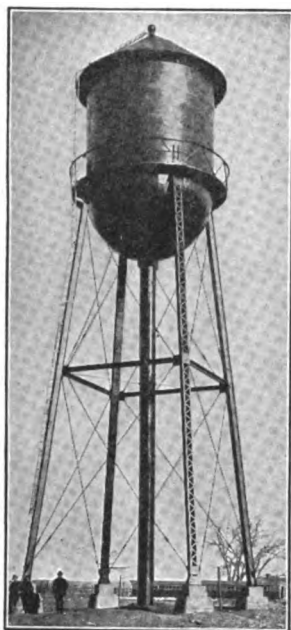
TRADE-MARK

heavier material than is used in standard storage tanks.

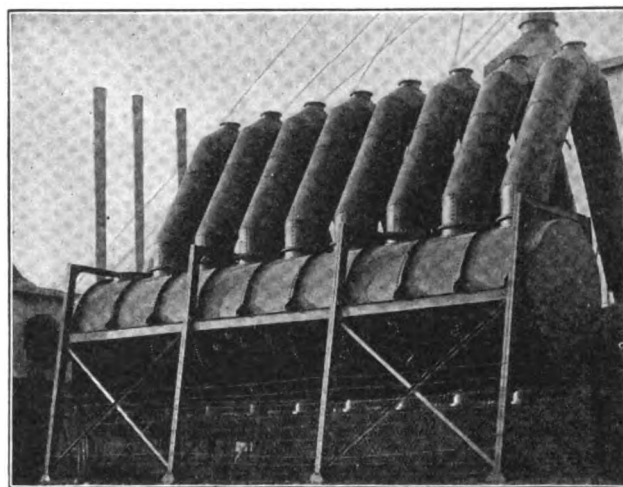
We build special tanks for all purposes and are always glad to make recommendations regarding their design.

Refinery Equipment

Stills, agitators, condenser boxes, towers, in fact the complete refinery can be constructed with our facilities. We build either to special, or our own standard designs.



TOWER TANK



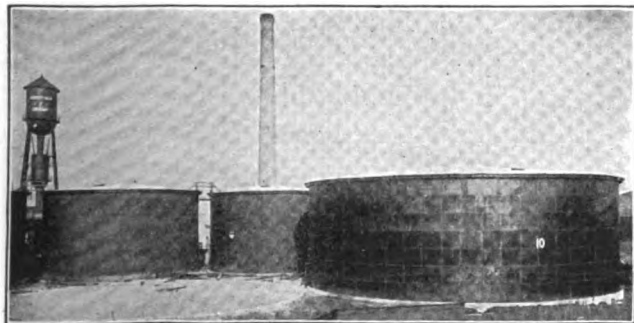
FLUES FOR RECOVERY OF METAL DUST

Miscellaneous

Among the many other Graver products which deserve special mention are the following:

Gas purifiers
Vulcanizing retorts
Mixing tanks
Flumes
Vacuum tanks
Measuring tanks
Dipping tanks

Inquiries received on these or any class of steel plate construction will receive prompt and careful attention.



TANKS FOR TAR STORAGE



GAS PURIFIERS

LANCASTER IRON WORKS, INC.

Steel Plate Construction

552 South Prince Street
LANCASTER, PA.

Products

STEEL PLATE CONSTRUCTION, including:

Tanks: Field Storage, Horizontal Storage, Pressure, Rectangular Open Top, Jacketed, Mixing; Stacks; Breechings; Standpipes; Penstocks; Coal Bunkers; Blast Furnaces; Riveted Pipe; Dredge Pipe and Accessories.



A large stock of materials always on hand means prompt shipment.

Lancaster's organization is made up of men who know the practical as well as the theoretical side of

tank building and steel plate construction. Very often by suggesting changes in design which will combine good shop practice with sound engineering principles they can save you time and money.

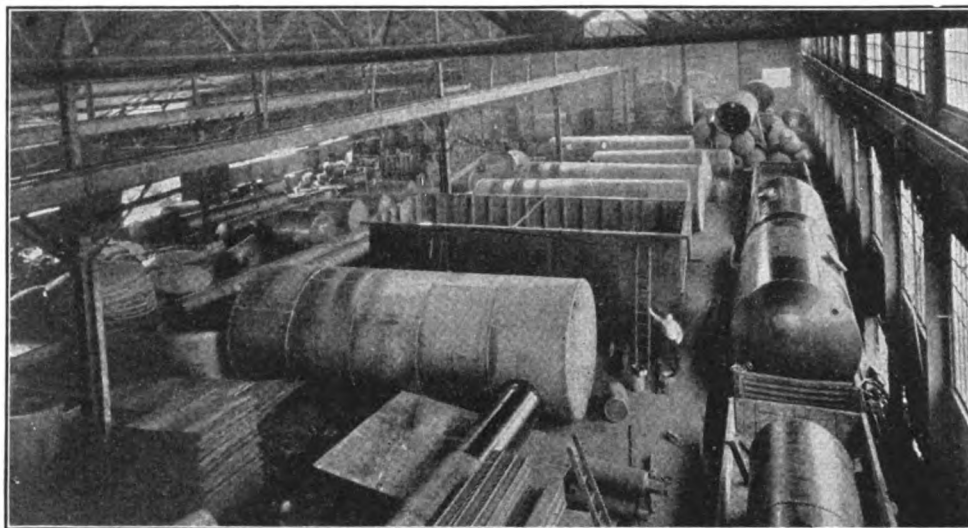
Facilities

The plant comprises a plate shop, machine shop, foundry and pattern shop, so that no part of the work has to be done outside.

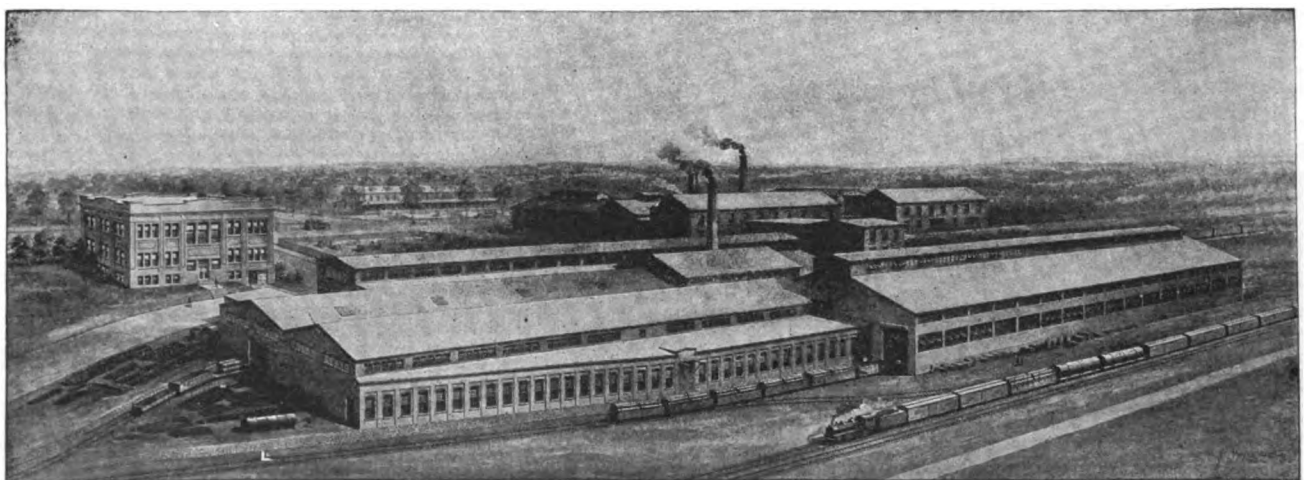
Two railroads—the Pennsylvania and the Philadelphia & Reading—insure good car supply.

Bulletins

Bulletin No. 60 gives all the details of Storage and Pressure Tanks. Capacities, 100 to 2500 gals. Send for handbook showing specifications of Lancaster Standard Field Storage Tanks. Capacities, 1,000 to 74,000 bbls.



LOADING BAY IN OUR PLANT



GENERAL OFFICES AND SHOPS, LANCASTER, PA.

TIPPETT & WOOD

Designers, Manufacturers and Erectors of Steel Plate Construction

166 Howard Street
PHILLIPSBURG, N. J.

BRANCH OFFICE, Royal Building, Cor. William and Fulton Streets, NEW YORK, N. Y.

Products

STANDPIPES, WATER TOWERS and STEEL TANKS of every description and for all purposes.

Tanks: Acid, Brine, Car, Coal Tar, Creosoting, Crude Oil, Cyanide, Elevated, Filter, Fuel Oil, Galvanizing, Gasoline, Jacketed, Molasses, Pressure, Refined Oil, Soap, Storage, etc.; Smokestacks, Breechings, Flues, Flumes, Penstocks, Riveted Pipe, Cylinders, Boilers, Condensers, Ladles, Hoppers, Troughs, Pans, Dryers, Receivers, Bins, Supports, Trestles, Accumulators, Agitators, Buckets, Cable Towers, Caissons, Clarifiers, Cylinders, Desiccators, Drums, Gas Holders, Hearth Jackets, Jacketed Kettles, Railway Water and Coaling Stations, Stills, Turntables, Water Jackets, Accessories for Water Towers and Standpipes and all kinds of Plate Steel Work and Structural Steel Construction requiring unusual fabrication.

Quick Shipments

We carry a large stock of steel plates of several

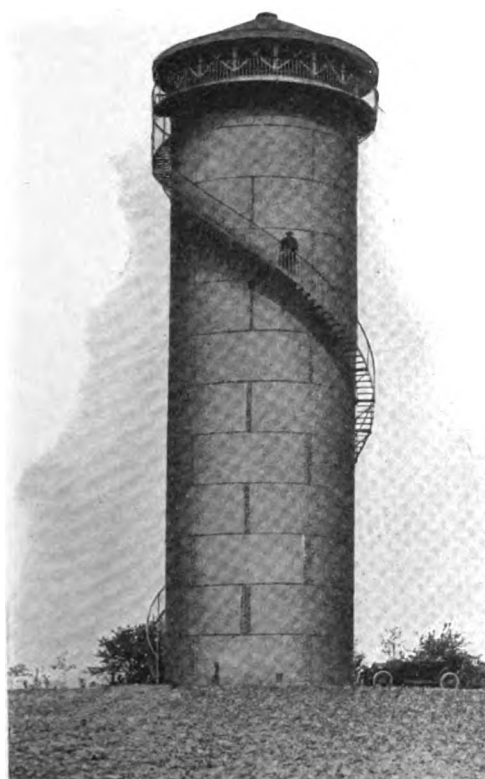
thicknesses from which we make tanks of a large range of diameters. For special requirements, permit us to make slight substitutions from our stock, and fabrication will proceed immediately. We are equipped and prepared for orders requiring concentration of effort resulting in unusually prompt completion of the work.

Facilities

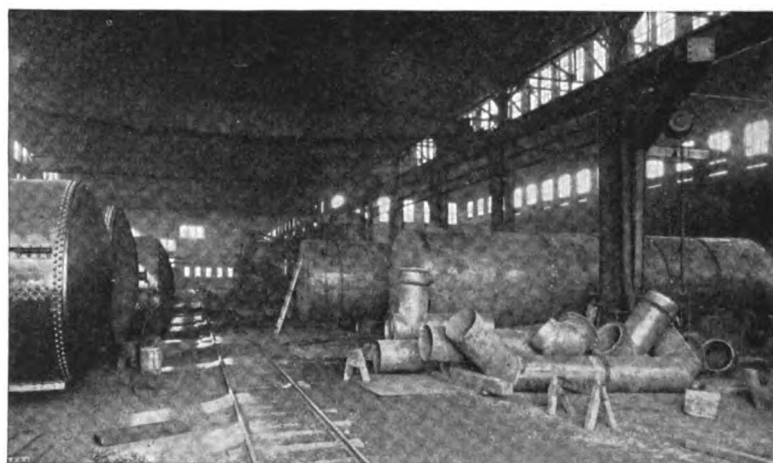
Our fifty years of experience are your benefit and assurance of proper attention and construction. Our shops, which are large and equipped with the most modern machinery, have expanded steadily during this time. We are constantly extending and installing new machinery and new methods. No work is too large for us. Send us inquiries stating when material is required. Our engineers are at all times at your service. A catalogue giving information on standpipes and water towers will be mailed on request.



STANDARD WATER TOWER



STANDPIPE FOR CONNECTICUT AGRICULTURAL COLLEGE
Diameter, 25 ft.; height, 80 ft.



ASSEMBLING SHOP

WALSH'S HOLYOKE STEAM BOILER WORKS

Steel Plate Construction

Riverside

HOLYOKE, MASS.

BRANCH OFFICE AND WORKS, DRUMMONDVILLE, QUEBEC, CAN.

Products

All classes of LIGHT and HEAVY STEEL PLATE CONSTRUCTION, including Riveted and Welded Tanks of every description for water storage, compressed air, acid, filters, rosin, size, heaters, blow-off, receiving, oil, caustic soda, brine, molasses, fuel oil and tar.

Diffusers, Digestors, Incinerators, Barking Drums.

Penstocks, Riveted Steel Pipe, Surge Pipes, Wheel Cases and Draft Tubes; Smokestacks, Flues, Rotary Bleach Boilers, Standpipes, Kiers, Flumes, Expansion Joints for pipe lines, etc.

Light Gage Dipped Pipe for bolted or flanged joints or continuous riveting.

Fabricated Plates of every description.

Structural Steel for construction, bridges, etc.

Services

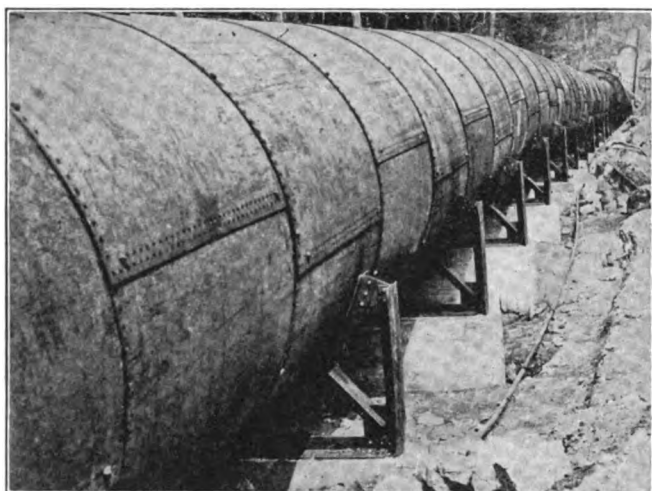
The practical experience of this company in designing, constructing and erecting is at the service of prospective customers.

The engineering department of this organization will assist in the solution of all steel plate construction problems.

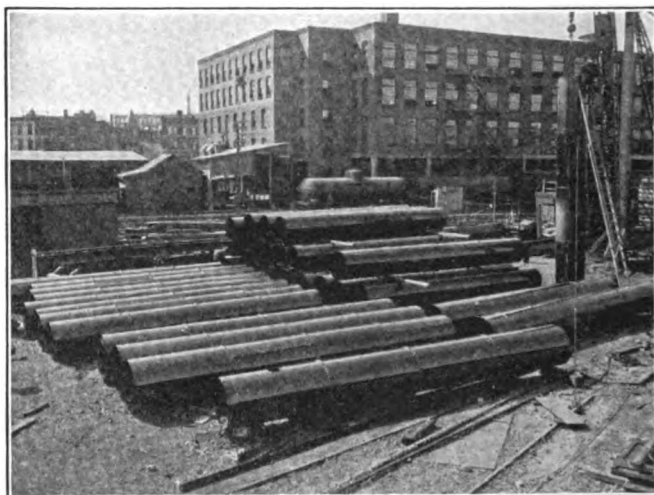
A satisfactory solution is assured, as has been accomplished for many others.

Facilities

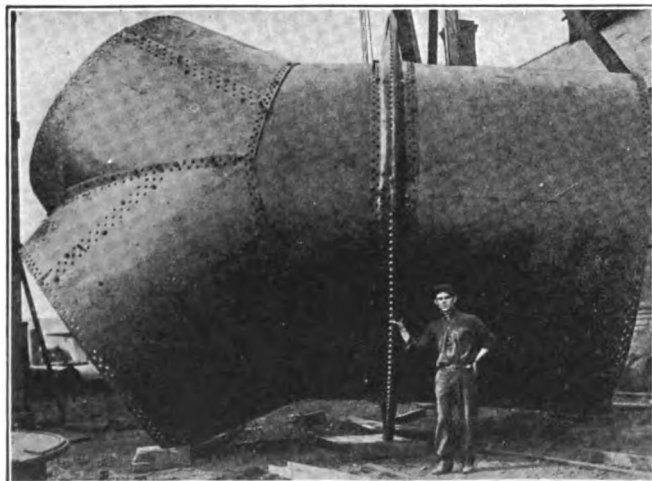
A corps of skilled and experienced mechanics, modern shop tools and portable field equipment insure prompt and satisfactory execution of all contracts.



PENSTOCK, STEEL CRADLES AND EXPANSION JOINTS, EAGLE FALLS, N. Y.



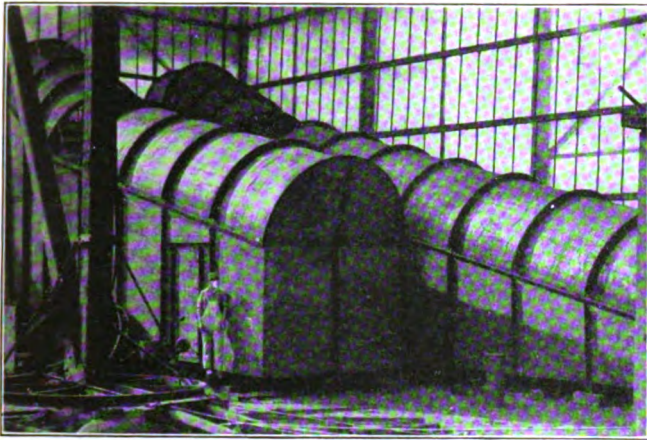
ASPHALTUM DIPPED PENSTOCK READY FOR SHIPMENT



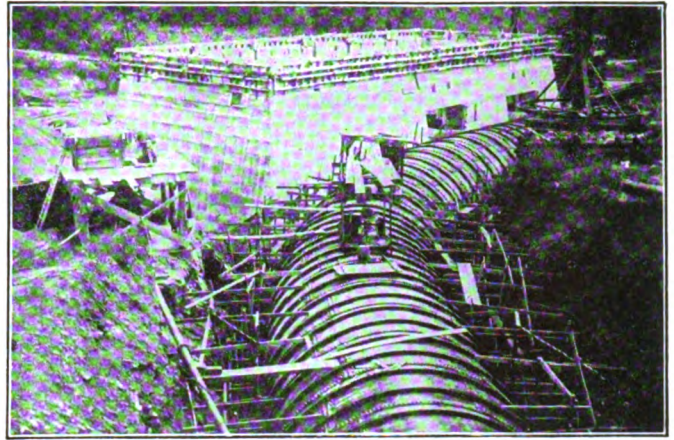
Y-CONNECTION SHOWING EXPANSION JOINT



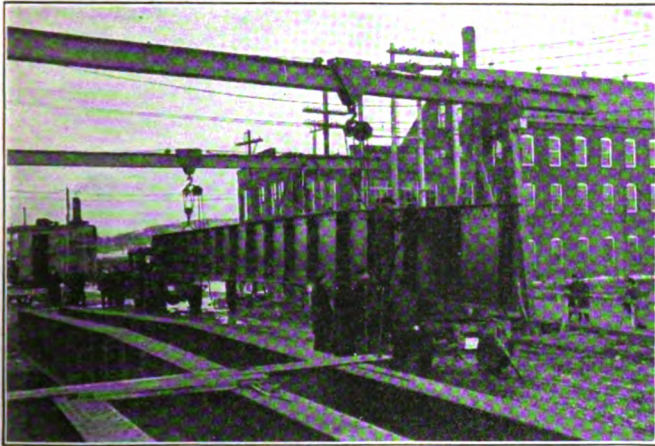
LARGEST BLEACH BOILERS IN WORLD READY FOR SHIPMENT



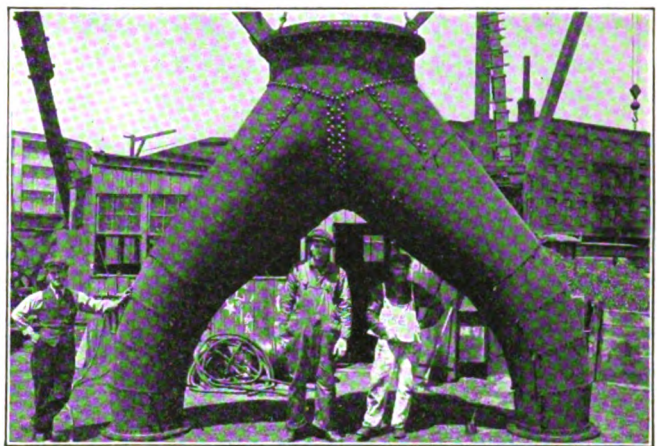
SMOKE FLUES FOR DWIGHT P. ROBINSON CO., PENNSYLVANIA
PUBLIC SERVICE CORP., SEWARD, PA.



20-FT. DIAMETER PENSTOCK, ERECTED AT BRIDGEWATER, N. C.



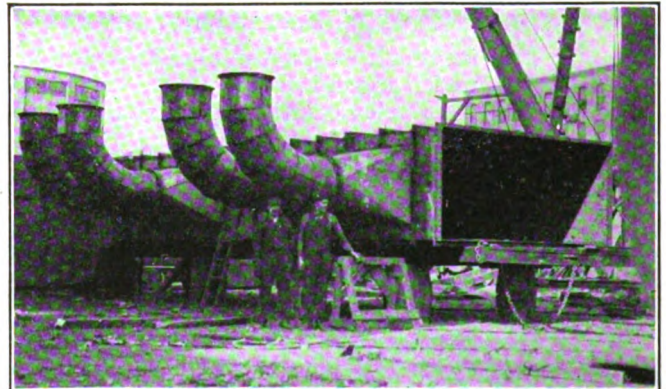
ERECTING 15-TON GIRDERS ON HIGHWAY BRIDGE BY NOVEL
METHOD



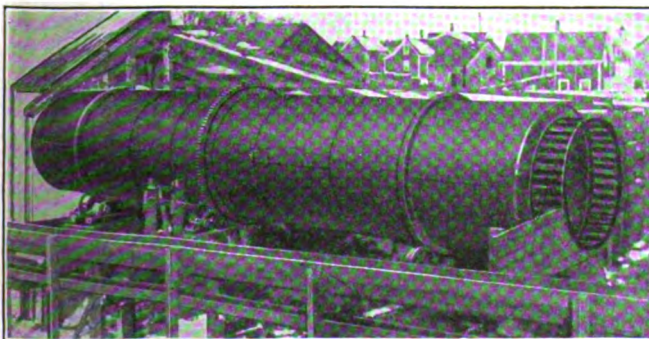
"Y" PIECE CONNECTING PENSTOCK TO DISTRIBUTOR



PENSTOCK FOR CLEVELAND CLIFFS CO., ISHPERING, MICH.
READY FOR ERECTION



AIR DUCTS FOR STONE & WEBSTER CORP., LOWELL GAS LIGHT CO.,
LOWELL, MASS.



WALSH (PULP WOOD) BARKING DRUM OPERATING AT
PASSADUMKEAG, ME.



MATCH SPLINT DRYER FOR DIAMOND MATCH CO.

ESTABLISHED 1867

INCORPORATED 1908

JOHN WOOD MANUFACTURING COMPANY

Manufacturers of Range Boilers and Welded Specialties
CONSHOHOCKEN, PA.

BRANCH OFFICES

NEW YORK, N. Y., Bush Terminal Building, No. 5
BOSTON, MASS., 60 Pemberton Square

CHICAGO, ILL., 320 East North Water Street
OAKLAND, CAL., 335 Cypress Street

CLEVELAND, OHIO, 1841 Carter Road

FOREIGN REPRESENTATIVES

CANADIAN JOHN WOOD MANUFACTURING COMPANY, LIMITED
TORONTO, ONT., CANADA

Products

RANGE BOILERS.
PNEUMATIC TANKS.
AIR COMPRESSOR TANKS.
RAILWAY FORGE TANKS.
CONTAINERS FOR LIQUIDS.
ICE CREAM CANS.

Also manufacturers of Water Tanks
and Tanks of all kinds for all purposes.

Electric Weld

TRADE-MARK
(Registered)

boilers are stenciled with working pressures. Each boiler is tested to double its working capacity.

Tanks—Pneumatic, etc.

Air pressure tanks for air compressors, hydropneumatic systems and similar service are specialties with this company. They are built from 50 lbs. working pressure to 500 lbs. working pressure.

Advantages of "Electric Weld" Construction

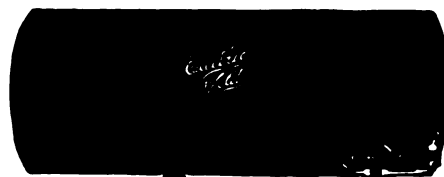
All products of this company have electric welded longitudinal joints, recognized as the best possible insurance against leaks. Electric welding of the longitudinal joint is the only means by which air tanks can be constructed and guaranteed to be absolutely tight without galvanizing or soldering. A riveted joint must be soldered or galvanized, if it is to be tight even under moderate pressure.

The head and bottom joints are made by expanding the shells by heating, and then shrinking the heads into position. The head and bottom seams are then securely brazed with first quality brazing solder. This is the only construction that makes possible an absolute metal-to-metal joint in the end seams. All tanks made by this firm are tested before shipment and must prove absolutely airtight under pressure that would be impossible for riveted construction to resist.

Range Boilers

Range boilers can be furnished from stock, without delay, in all sizes up to and including 192-U.S. gal. capacity. Double extra heavy range boilers are made of special analysis steel. All

Size and location of pipe connections according to requirements. Finished plain, galvanized or painted black.



AIR TANK

Containers

Steel shipping containers are constructed for domestic and international service in shipping any kind of liquids. They are made with or without removable lids, and have given entire satisfaction where other containers have proved unreliable or too expensive.

The demand for welded containers is increasing daily. This firm is particularly well equipped to meet any requirements in this line.



CONTAINERS

Ice Cream Cans

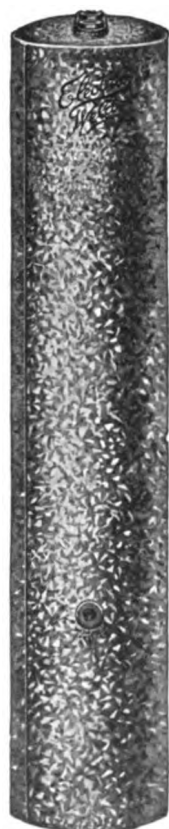
Electric Weld rivetless-solderless ice cream cans in 6-, 8-, 20- (high or low), 30-, and 40-qt. capacities in lots of 1 to 20,000. Cans protected by patents pending. Built for long usage at low maintenance cost, owing to adaptability to retinning.

Capacity

The plant of the JOHN WOOD MANUFACTURING COMPANY produces, daily, 2000 range boilers, in addition to large quantities of storage tanks, gasoline tanks and similar products.

Service

The Service Department will gladly co-operate with prospective purchasers' drawings, and offer suggestions on any welded project or device.



RANGE BOILER



RAILWAY FORGE TANK

ESTABLISHED 1854

R. D. COLE MANUFACTURING CO.

Manufacturers of Boilers, Tanks and Steel Plate Work
NEWNAN, GA.

Products

COLE-MANNING VERTICAL BOILERS; HORIZONTAL RETURN TUBULAR BOILERS.

STEEL TANKS and TOWERS; STANDPIPES.

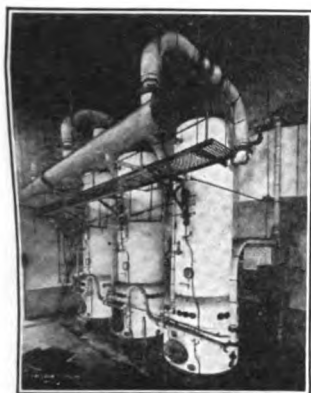
STEEL PLATE CONSTRUCTION: Steel Stacks, Acid Tanks, Storage Tanks, etc.

Cole-Manning Boilers

Cole-Manning boilers are vertical fire tube boilers constructed in units up to 400 h.p. and for varying working pressures up to 200 lbs.

Very high efficiencies are obtained with Cole-Manning boilers due to the uniform distribution of furnace gases over the heating surface.

They occupy less floor space per horsepower than any other type of boiler on the market.



BATTERY OF COLE-MANNING BOILERS

Cleaning on the crown sheet is taken care of by a series of handholes put in line with this crown sheet, making it very accessible.

All radiant heat is directly absorbed by the water heating surface, as there is no brickwork to absorb the heat, and, due to the absence of brickwork, maintenance is low; there are no infiltrations of air and radiation losses are reduced to a minimum.

Another feature of these boilers is their ability to deliver up to 50° or more of superheated steam, making them particularly adapted for turbines.

Boiler shell is supported on a 1-piece cast iron base which can be fitted with stationary or shaking grates. Smokebox is provided with removable cast iron cover and provided with connection for all standard soot-cleaning devices.

The evaporative performance, superheating qualities and small floor space per horsepower, contribute to make this type boiler a most desirable and economical unit.

Full information regarding Cole-Manning boilers may be had from this company's engineering department.

Horizontal Return Tubular Boilers

Constructed in a most approved manner and of materials in full accordance with the A.S.M.E. code.

Standard settings can be provided with stationary or shaking grates, and where increased efficiency and compactness are desired standard steel casings can be provided for these settings.

These boilers are designed with liberal proportions of heating surface, steam space and grate area. Within the limits of their usefulness, they are unsurpassed as steam generators.

Constructed in units up to 250 h.p. and for steam pressure of 200 lbs. per sq. in.

Steel Tanks, Towers and Standpipes

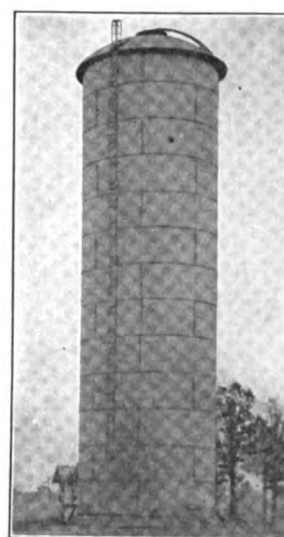
This company designs, fabricates and erects steel tanks and towers for sprinkler or general service, also standpipes.

Cole elevated tanks are correct in design. Their simplicity contributes to their low cost of maintenance. Sprinkler tanks and equipment are designed to incorporate the recommendations of all insurance authorities.

This company has been building tanks, towers and standpipes for over 20 years and its exceptional facilities, together with its large force of tank ex-



STEEL TANK AND TOWER

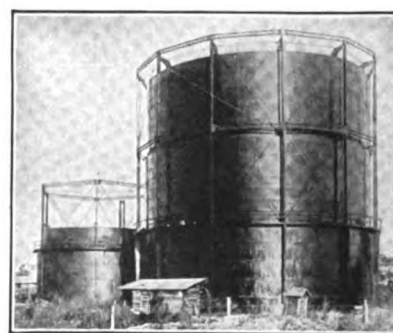


STANDPIPE

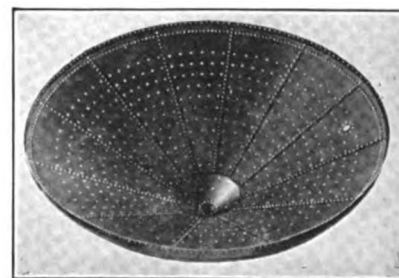
perts, insure reliable work and prompt delivery.

Steel Plate Construction

The facilities of the R. D. COLE MANUFACTURING Co. provide for the design and construction of all forms of steel plate work, including smokestacks, acid and pressure tanks, structural frames and towers, etc. A large and experienced engineering department is at the service of prospective customers to assist in solving their problems.



GAS HOLDER



JACKETED KETTLE

THE BABCOCK & WILCOX COMPANY

Manufacturers of Water Tube Boilers, Superheaters and Stokers

85 Liberty Street
NEW YORK, N. Y.

BRANCH OFFICES

BOSTON, 49 Federal Street
PHILADELPHIA, North American Building
PITTSBURGH, Farmers Deposit Bank Building
CLEVELAND, Guardian Building
CHICAGO, Marquette Building
CINCINNATI, Traction Building
HONOLULU, H. I., Castle and Cooke Building

ATLANTA, Candler Building
TUCSON, 21 S. Stone Avenue
FORT WORTH, Flatiron Building
NEW ORLEANS, 521-5 Baronne Street
DETROIT, Ford Building
DENVER, 435 Seventeenth Street
SAN JUAN, PORTO RICO, Royal Bank Building

SALT LAKE CITY, 705-706 Kearns Building
SAN FRANCISCO, Sheldon Building
LOS ANGELES, 404-406 Central Building
SEATTLE, L. C. Smith Building
HAVANA, CUBA, Calle de Aguiar 104
HOUSTON, Southern Pacific Building

Products

BABCOCK & WILCOX, RUST and STIRLING WATER TUBE BOILERS; MECHANICAL STOKERS; SUPERHEATERS.

Introduction

Boiler practice has changed materially in the past 10 years. Higher pressures and higher superheat have come into everyday practice and with these changes have also come larger units and higher rates of combustion, due to better stokers and furnace arrangement, better methods of feed water treatment, improved coal and ash handling apparatus, and a better understanding of the care and operation of boilers. During this period great improvements have been made in the utilization of fuels other than coal. These developments have brought about a change in boiler room design and necessitate a much more careful study of the size of the plant, service conditions, fuel, water and class of boiler room help available. By reason of the different factors involved, the selection of a proper boiler unit is much more complex than in the past. Years ago this company manufactured a line of so-called "standard" boilers. These standards are still in existence, but the sale of a standard boiler today is a rarity, because operating conditions can not be even approximately standardized. Each boiler sale is approached by this company as an entirely new and independent engineering problem, the factors involved determining the particular type, size and setting of boiler offered.

Each of our boilers is built to conform with the A. S. M. E. code, and a certificate of shop inspection by the Hartford Steam Boiler Inspection & Insurance Co. or other qualified inspection company will be furnished.

About 30,000,000 h.p. of boilers manufactured by THE BABCOCK & WILCOX COMPANY are in use.

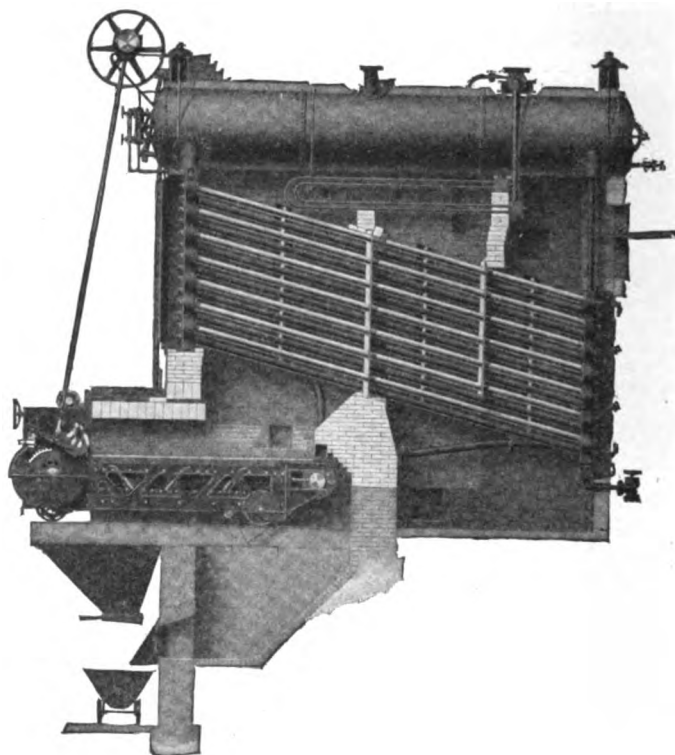
Babcock & Wilcox Boiler

The heating surface is made up of sections, each consisting of tubes and a header at each end, connected to a drum or drums above them. The longitudinal drum type is illustrated, but the company also builds a cross drum type having the drum transverse to the sections. The lowest point of each section is connected to a mud drum.

The headers into which the tubes are expanded are of forged steel and of sinuous form so that the tubes are in a staggered position when assembled. This staggering of the tubes breaks up the gases and causes them to impinge on every tube.

Opposite each tube end in the headers there is a handhole of sufficient size to permit inspection, cleaning or renewal of the tube. Handholes are closed by suitable handhole fittings.

The gases of combustion are caused to make three passes over the heating surface by baffles constructed of special brick and cast iron flame plates. The furnace is readily adaptable to any fuel available, solid, liquid, or gaseous.



BABCOCK & WILCOX BOILER EQUIPPED WITH BABCOCK & WILCOX SUPERHEATER AND BABCOCK & WILCOX CHAIN GRATE STOKER

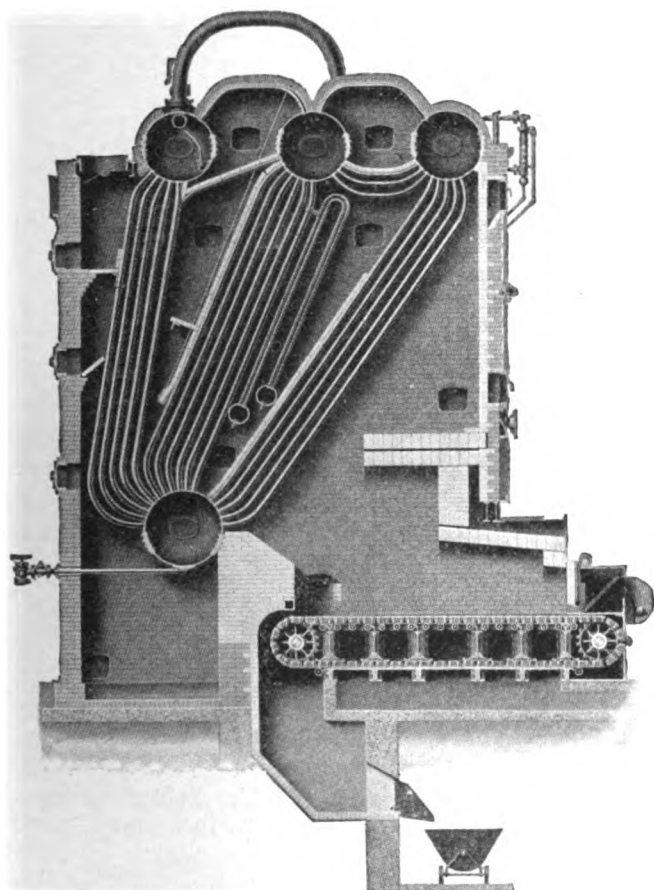
The boilers are suspended front and rear from steel supporting frames, independent of brickwork. Patent dusting doors permit keeping all heating surfaces free from soot and dust. Large doors in the sides of the setting give access to all parts.

Stirling Boiler

The Stirling boiler consists of three transverse steam and water drums set parallel and connected to the mud drum by three banks of water tubes curved to enter the drums radially. The center drum is connected to the front and rear drums by steam circulating tubes and to the front drum by water circulating tubes. Any tube can be removed without disturbing any other tube or brickwork.

The furnace is formed by a firebrick arch sprung across the setting in the space between the front wall and front bank of tubes. This furnace is adapted to any stoker and for burning any class of fuel. Gases of combustion are led from the furnace over the heating surface by a baffle resting on the rear tubes of the front bank and on the rear tubes of the second bank.

The boiler is supported on a steel framework entirely independent of the brickwork setting. Large cleaning doors in the sides of the setting give ready access to all portions for cleaning, inspection and repair.



STIRLING BOILER WITH BABCOCK & WILCOX SUPERHEATER AND BABCOCK & WILCOX CHAIN GRATE STOKER

Rust Boiler

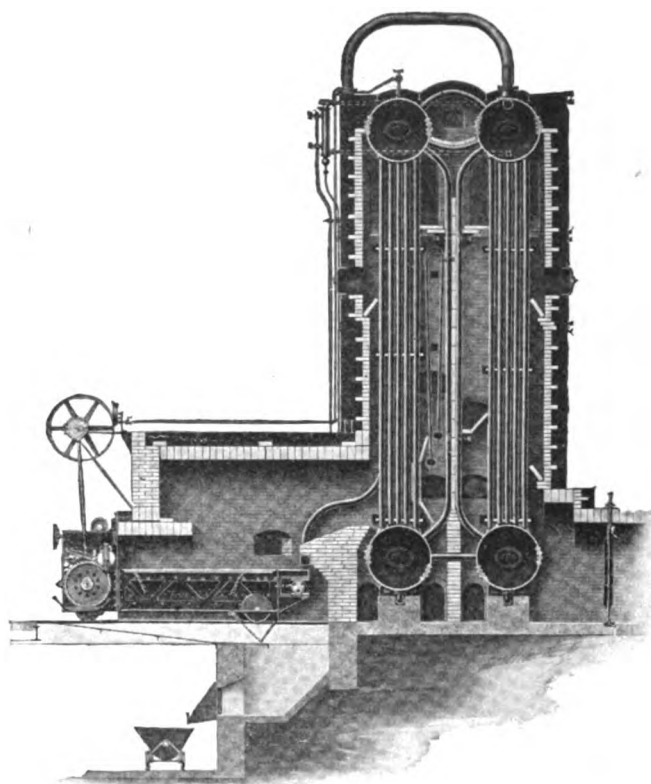
The Rust boiler has two transverse steam and water drums and two transverse mud drums. Each steam drum is connected to the mud drum below it by five rows of straight tubes and one row of curved tubes. The steam drums are connected by steam and water circulating tubes and the mud drums by water circulating tubes.

The tube sheets of all drums are pressed to form individual tube seats, thus permitting straight tubes to be expanded directly into cylindrical drums.

The tubes are staggered and so arranged that any tube may be removed without disturbing any other tube or the boiler brickwork.

The furnace is of the extension or Dutch oven type and any type of stoker or fuel can be used.

Gases are caused to pass twice over the heating surfaces by a vertical fire brick baffle, built between, and held in place by, the central curved tubes. Horizontal baffle shelves cause all of the heating surface to be swept by gases. The boiler is supported entirely free of the brickwork on cast iron saddles under the mud drums, the saddles resting on masonry foundations.



RUST BOILER WITH BABCOCK & WILCOX SUPERHEATER AND BABCOCK & WILCOX CHAIN GRATE STOKER

Babcock & Wilcox Steam Superheater

Made for installation in all types of boilers built by THE BABCOCK & WILCOX COMPANY and uniform in design, location and operation. The superheater consists of two headers into which tubes bent to a U-shape are expanded. These headers have handholes and forged steel handhole fittings, giving access to each tube end. There are no strains from contraction or expansion.

The superheater is located in all cases in the direct path of the products of combustion. The surfaces presented to the gases are smooth, offer minimum resistance to the passage of gases and the least opportunity for the adhesion of dust.

Steam is taken from the dry pipe, introduced into the intake header and passes through the superheater tubes to the outlet header, to which the superheated steam connection from the boiler is made.

Babcock & Wilcox Chain Grate Stoker

Consists of a grate in the form of an endless chain passing at the front and rear of the furnace over sprockets keyed to shafts carried by the stoker frame. The grate passes through the furnace continuously. The stoker is driven through a worm wheel on the front sprocket shaft and fuel is fed uniformly to the front of the grate under an adjustable stoker gate. Volatile gases are driven off on the forward portion of the grate under an ignition arch and are consumed in passing over the incandescent fuel before striking the heating surface. Ash and refuse are discharged as the grate turns over the rear sprocket. The form of the grate links allows proper admission of air for combustion. Suitable side seals and a bridge wall water box (connected into the water circulation of the boiler) prevent the admission of large quantities of excess air.

Write for catalogues to the nearest branch office.

THE D. CONNELLY BOILER CO.

Ivanhoe Road and N. Y., C. & St. L. R. R.
CLEVELAND, OHIO

Products

CONNELLY WATER TUBE STEAM BOILERS.

Design of Boilers

The Connelly water tube boilers are built in two general designs: one being the 4-drum type for units up to about 1500 h.p., equipped with stokers on one side only; the other being a 6-drum type for units from 1000 to 4000 h.p., equipped with stokers on two sides. Pressure parts are designed and built to conform with A.S.M.E. boiler code.

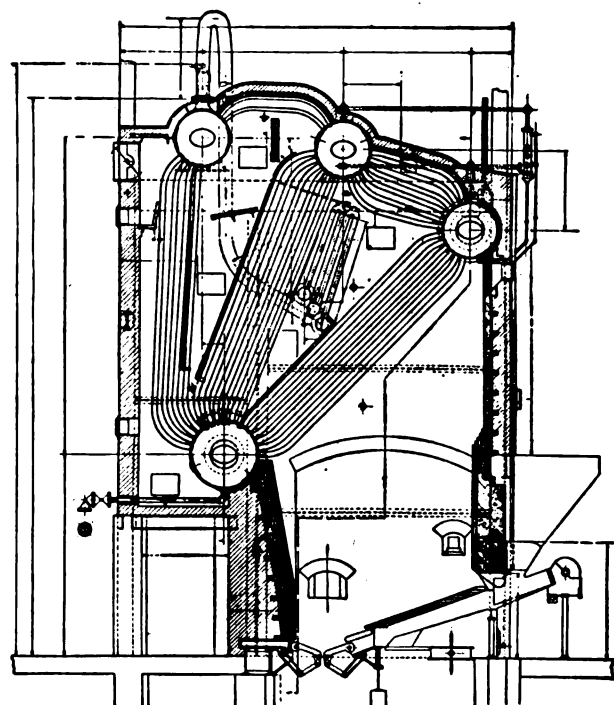
These two general designs are each made in a number of classes to meet the conditions of available space and can be fired with coal, gas, oil, waste heat, or blast furnace gases.

Advantages

- (1) Designed so as to be capable of manufacture in units up to 4000 h.p.
- (2) Simple in design and has no flat surfaces.
- (3) Free from complications of hundreds of joints. (No handholes at end of tubes.)
- (4) Has no staybolted surfaces.
- (5) Boiler contains a large amount of water in proportion to its size.
- (6) Boiler has a large amount of steam liberating surface, and also large steam space.
- (7) All stress due to expansion and contraction is provided for (both water drums being suspended).
- (8) Boiler tubes are so spaced that any tube can be removed without removing any other tube.
- (9) Boiler is designed so as to get the greatest horsepower in the smallest cubical space.
- (10) All baffling is simple, and easy to replace or re-adjust.
- (11) Boiler has free and unrestricted circulation, owing to the same tube area between drums in the path of water circulation.
- (12) The large volume of water, liberal steam space, abundant steam liberating surface and unrestricted circulation, mean high efficiency, large overload capacity and minimum repair expense, or loss of tubes.
- (13) Water is fed into rear upper drum, so that coldest water meets the coldest gases. This means low temperature of gases entering stack.
- (14) Every pressure part of boiler is made of high quality steel (no cast iron used).
- (15) Boiler is so designed that it will deliver not only commercially dry steam, but will deliver superheated steam.
- (16) Entire boiler is swung from a steel frame (independent of brickwork) so as to provide against undue stresses on the brick setting.

Shop Facilities

The plant occupies a site of six acres on the main line of the New York, Chicago & St. Louis R. R.



CROSS SECTION, CONNELLY BOILER EQUIPPED WITH UNDERFEED STOKER OF TAYLOR TYPE

The main building is 140 ft. wide, divided into three bays (40 ft. on each side and 60 ft. in center). Each side bay is equipped with a 10-ton electric overhead traveling crane, and the center aisle is equipped with a 25-ton electric traveling crane. All cranes operate full length of building.

Riveting plant consists of a 15-ft. gap hydraulic riveter, exerting a maximum pressure of 150 tons. This machine is served by an overhead hydraulic crane of 25-ton capacity. Riveter stake is equipped with a special type top, by which it is possible to rivet heads of drums or boilers into the shell under hydraulic pressure. Another hydraulic riveter, 10 ft. 6-in. gap, with a capacity of 80 tons pressure on the rivet is also installed.

Two modern plate planers with a capacity of 22 ft. cut on 1½-in. metal at one setting are used for planing edges of all heavy shell plates and butt straps.

The plant is well equipped with modern drills for cutting rivet and tube holes.

Flanging department has a 500-ton hydraulic press of the 4-post type, also a 150-ton Universal type hydraulic press, capacity up to 160-in. heads, and a modern spinning machine for flanging flat heads up to 108-in. diameter.

In addition there is also a complete line of punches, shears, rolls, a complete pneumatic equipment, and all modern tools for producing highest quality of work.

A modern tube bending machine is installed and tubes for any boiler can be furnished within a few hours after notice to ship.

J. F. DAVIS & SONS COMPANY

Manufacturers of Water Tube and Return Tubular Boilers

Harris Trust Building

CHICAGO, ILL.

WORKS: WEST DE PERE, WIS.

AGENCIES

MILWAUKEE, WIS., M. E. S. Co., Merchants & Mfrs. Bank Building
KANSAS CITY, MO., B. C. Moss, 707 Mutual Building
DENVER, COLO., MOUNTAIN STATES MACHINERY Co., 538 U. S. Nat.
Bank Building

OMAHA, NEBR., W. E. HYLAND, 728 World-Herald Building
SEATTLE, WASH., P. W. SCHUBERT, 220 Railway Exchange
SAN FRANCISCO, CAL., BLISS & LYON, 702 Balboa Building.

Products

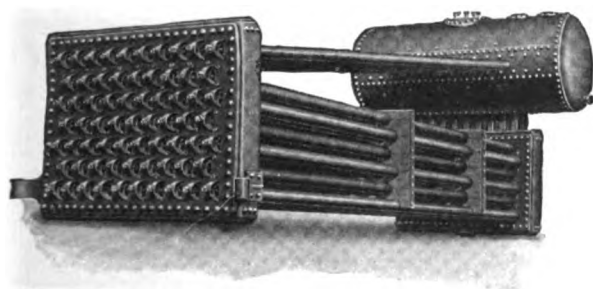
HORIZONTAL and CROSS DRUM WATER TUBE BOILERS; RETURN TUBULAR BOILERS; STEEL PLATE CONSTRUCTION.

Horizontal Water Tube Boiler

This boiler is all wrought steel construction, with horizontal water drum and steel plate staybolted water legs riveted thereto. Tubes are straight. Each tube has a steel handhole plate opposite each end giving complete access for inspection, cleaning and repairs. This type of boiler is built for pressures from 175 to 300 lbs. per sq. in. and in units from 90 to 1500 h.p. or more.

Cross Drum Water Tube Boiler

This boiler has all of the advantages of the standard horizontal type with the additional advantage of low headroom, and ease of installation in cramped quarters. The boiler is shipped knocked down and any part may be taken through an opening of limited size. This boiler



CROSS DRUM WATER TUBE BOILER

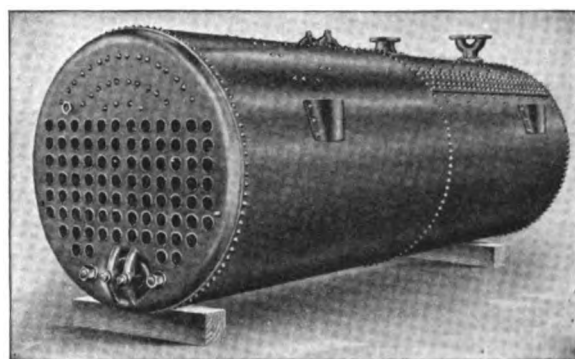
is perfectly adapted for power purposes and is characterized by a high efficiency, delivery of dry steam and perfect reliability under the severest working conditions.

Cross Drum Boiler for Medium Pressure

By using smaller tubes and building the cross drum type of boiler for a pressure of 125 lbs., we are producing a boiler especially for heating purposes. No boiler has been devised that is better adapted for this service. This boiler in its field has all of the advantages of the standard cross drum boiler.

Return Tubular Boiler

Our shop is supplied with modern and complete machinery equipment for building high grade return

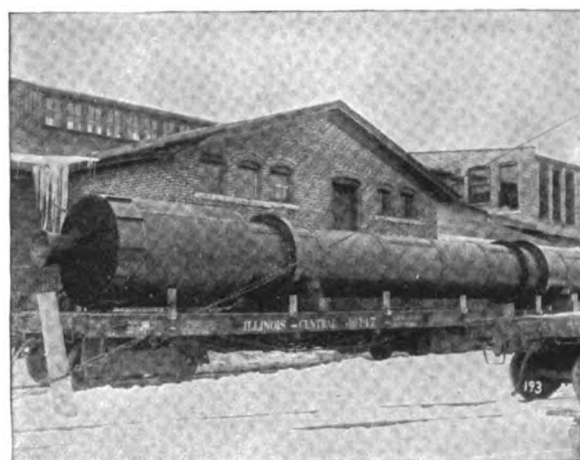


RETURN TUBULAR BOILER

tubular boilers. These boilers are built strictly in accordance with the A. S. M. E. Code.

Steel Plate Construction

Our shop is prepared by experience and equipment to build all classes of storage and pressure tanks, especially those classes involving machine work.



STEEL PLATE CONSTRUCTION

EDGE MOOR IRON COMPANY

Designers and Builders of The Edge Moor Water Tube Boiler

EDGE MOOR, DEL.

BRANCHES

BOSTON, MASS., 79 Milk Street
NEW YORK, N. Y., 111 Broadway
PITTSBURGH, PA., 309 Oliver Building

CHICAGO, ILL., 1549 Otis Building
ST. PAUL, MINN., 4th & Wacouta Streets
CHARLOTTE, N. C., 1100 Realty Building

Product

EDGE MOOR WATER TUBE BOILERS.

Edge Moor Boilers Exceed A. S. M. E. Requirements

Edge Moor Water Tube Boilers are built to specifications which exceed the requirements of the A. S. M. E. Code for high-pressure service.

All-steel Construction

The Edge Moor Boiler, exclusive of handhole plates, is strictly an all-steel boiler. Handhole plates are furnished of forged steel or of cast iron of special construction which is approved under the A. S. M. E. Code. In no other part is cast iron used.



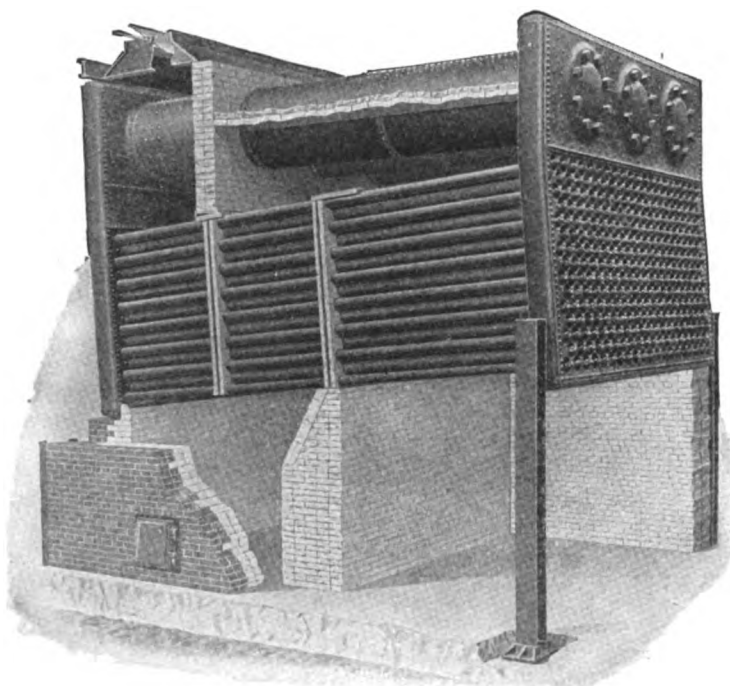
TRADE-MARK

Unrestricted Header and Drum Connection

A distinctive feature of the Edge Moor Boiler is extension of the headers, at full width, well above the drums. Contrary to the usual construction, the drums enter the headers with full area connection, thus providing a much larger throat, as shown in the illustration on the opposite page.

Built-up Headers

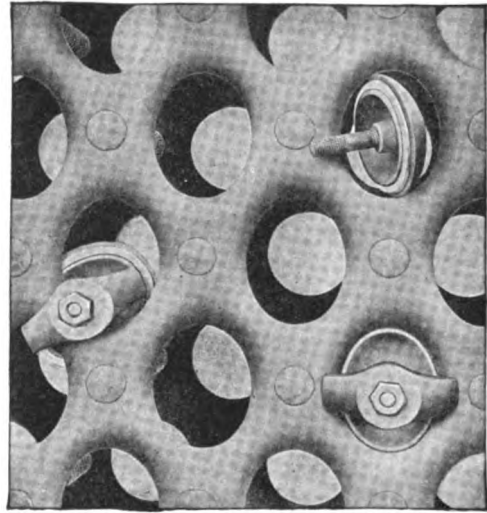
Just as a cable built up of strands of small wire is superior to a solid wire of the same diameter, so are built-up boiler headers far stronger and more reliable than those cast or forged in a single piece. For this reason all headers used in Edge Moor Boilers are of built-up construction.



NOTE HEADER CONSTRUCTION, HORIZONTAL DRUMS, STRAIGHT, INCLINED TUBES, AND EFFICIENT CROSS BAFFLING

Unique Method of Attaching Drums to Headers

The drums of Edge Moor Boilers are effectively attached to headers through the bulge plates by eight steel bolts, 2½ in. in diameter, anchored through steel U-plates riveted to the inside of drum (see illustration). Joint in header plate is made permanently tight by an annealed copper cone-nut which is drawn into conical hole in plate by screwing up on outside nut before stay-bolt is anchored.



ELLIPTICAL HANDHOLES MAKE IT POSSIBLE TO REMOVE ANY COVER WITHOUT DISTURBING ANY OTHER COVER, SAVING TIME AND GASKETS

All Handholes Elliptical

Every handhole in the Edge Moor Boiler is elliptical, thus making it possible to pass every cover through its own handhole, instead of from one hole to another, as must be done with most boilers.

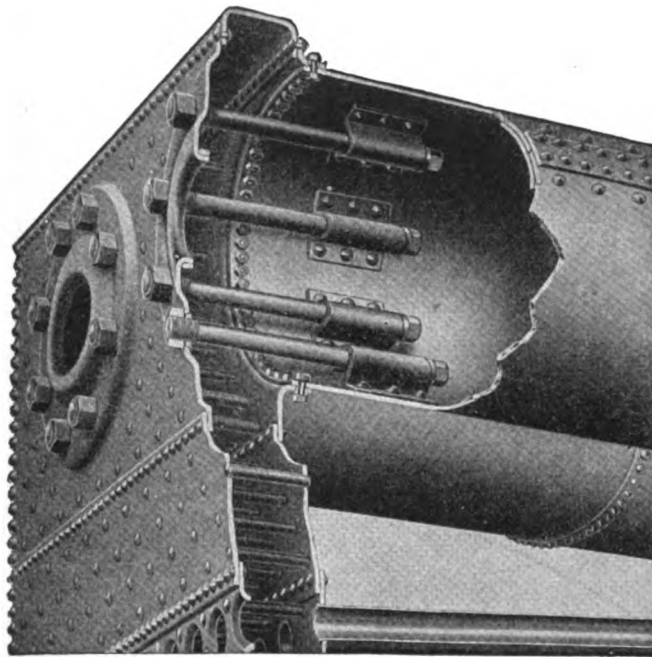
This Edge Moor feature considerably reduces the cost of labor when opening and closing boiler for cleaning or inspection.

Varied Types of Baffling

The baffling in Edge Moor Boilers can be supplied in a variety of combinations to meet individual conditions, and for use with any type of stoking or combustion device. We will gladly co-operate with you in jointly working out the best arrangement for any particular installation.

Waste Heat Boilers

For the utilization of waste gases, this company has developed an adaptation of its standard boiler which contains all the special Edge Moor features. This boiler, operated in connection with coke ovens, provides an effective means of utilizing waste heat.



DRUMS ENTER HEADERS WITH AREA CONNECTION

ERIE CITY IRON WORKS

Manufacturers of Boilers and Steam Engines

ERIE, PA.

REPRESENTATIVES IN THE PRINCIPAL CITIES OF THE UNITED STATES

Products

ERIE CITY VERTICAL and HORIZONTAL WATER TUBE BOILERS; IMPROVED "ECONOMIC" RETURN TUBULAR BOILERS; HORIZONTAL RETURN TUBULAR STATIONARY BOILERS; ERIE CITY PULVERIZED COAL APPARATUS; ERIE CITY "LENTZ" STEAM ENGINES.

Also manufacturers of Counter Current Feed Water Heaters; Tanks and Steel Plate Construction; Erie City Shaking Grates.

Erie City Vertical Water Tube Boiler

In this boiler there are two horizontal drums—one drum placed directly above the other; the two drums are connected by a series of tubes, the combination of drums and tubes being supported by a heavy frame of steel beams. A wall of masonry surrounds the boiler and, extending forward, forms the furnace, which is lined with fire brick and faced with a substantial steel front.

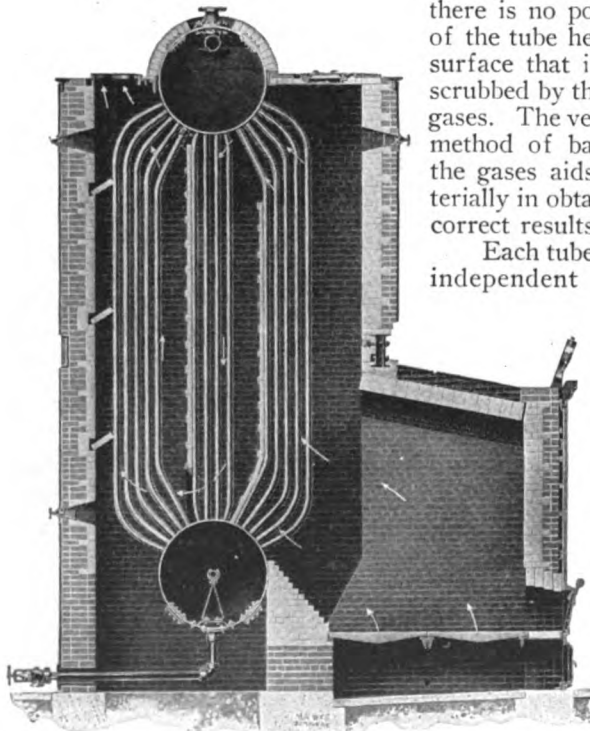
The design of this boiler eliminates the necessity for using either staybolts or braces and furthermore no handholes are required for cleaning or replacing the tubes. The elimination of handhole plates reduces the labor and time required for cleaning the boiler to a minimum. It can be closed ready for water in 15 minutes.

Less floor space is required than for other types of boilers having the same capacity and the design lends itself readily to the attachment of a superheater.

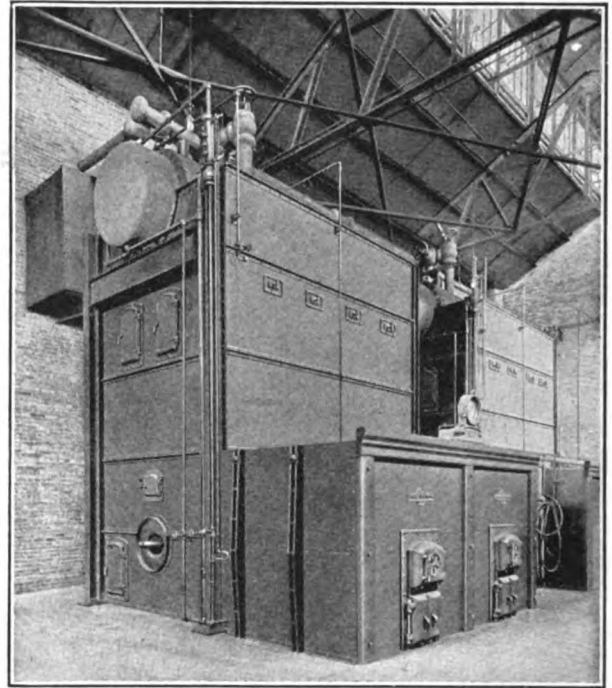
The dutch oven form of setting provides a superior method of burning coal either hand fired or by stoker, any type of which may be readily applied.

The tubes, being upright, permit the hot gases to surround them and there is no portion of the tube heating surface that is not scrubbed by the hot gases. The vertical method of baffling the gases aids materially in obtaining correct results.

Each tube is an independent unit



SECTIONAL VIEW BOILER AND FURNACE



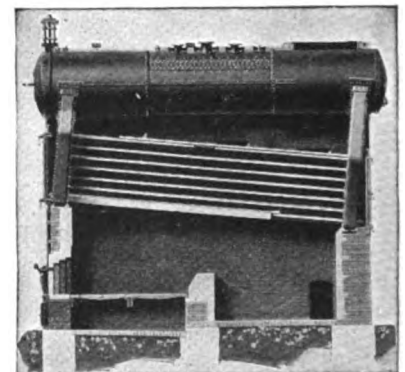
TWO 250 H.P. VERTICAL WATER TUBE BOILERS IN WESTERN UNITED GAS & ELECTRIC CO., ELGIN, ILL.

providing unlimited and unrestricted circulation, the rapidity of which depends entirely on the transfer of heat from the products of combustion. All tubes enter the drum radially below the water line, thereby providing the largest possible disengaging surface.

Tube renewals can be made readily by an ordinary mechanic. Owing to the fact that less soot and scale forms on vertical tubes, less coal is needed to evaporate the required amount of water.

The upper drum is constructed with steam spaces (patented) at the ends, causing the steam delivered to contain less than one-half of one per cent moisture.

Erie City Horizontal Water Tube Boiler



THE ERIE CITY HORIZONTAL WATER TUBE BOILER

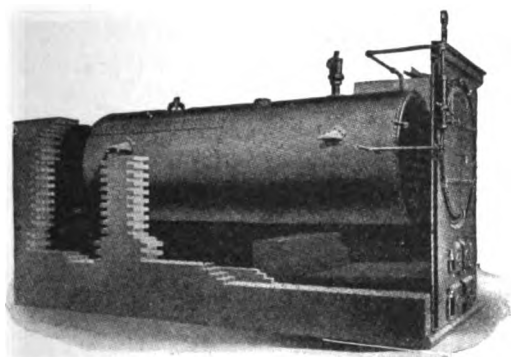
ERIE CITY IRON WORKS has been building this type of boiler for many years, and recently placed on the market a new style horizontal water tube boiler in which is eliminated, as far as possible, the weak points incidental to this particular type of boiler.

The illustration shows the ERIE CITY IRON WORKS' latest design of horizontal water tube boiler. A description of this boiler will be gladly furnished on application.

Erie City Horizontal Return Tubular Boiler

This type of boiler is built by this company to conform with the requirements established by the A. S. M. E. boiler code for 100 lbs. working steam pressure in sizes ranging from 25 to 250 h. p., and for 125 and 150 lbs. working steam pressure, in sizes ranging from 45 to 250 h. p.

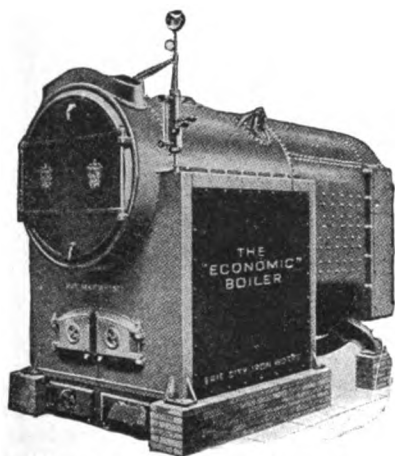
Before shipment all boilers are subjected to a hydrostatic test pressure 50% in excess of the designed working steam pressure, and a certificate of inspection will be furnished to this effect on request.



ERIE CITY HORIZONTAL TUBULAR BOILER

Erie City "Economic" Return Tubular Boiler

This boiler is built in ten sizes ranging from 25 to 150 h. p. to meet the requirements of the A. S. M. E. boiler code. Boiler is self-contained, occupies small space and is a rapid steamer. No staybolted water sides to fill with mud and burn out, or flat crown sheets to be exposed by low water and cause explosions and loss of life. Front and sides of furnace are lined with 9 in. of fire brick, with air space on outside wall next to steel casing.



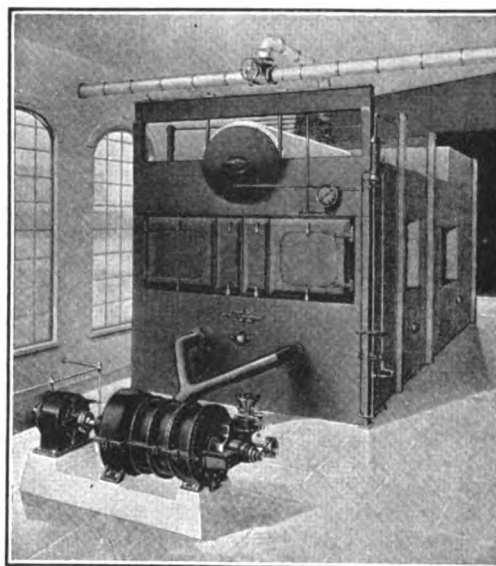
"ECONOMIC" RETURN TUBULAR BOILER
Regularly built for 100 lbs. working pressure, and for higher pressure on order

Erie City Pulverized Coal Apparatus

The perfected apparatus manufactured by this company is known as the Seymour pulverizer and furnace and can be applied to practically all boiler installations.

The pulverizer consists essentially of a cylindrical housing containing a rotor composed of pulverizing elements and a fan. Coal is fed to the pulverizer and reduced to a powder of such fineness that it burns practically like gas or oil. The fan draws in sufficient air to propel the coal through the pulverizer and at the same time support combustion. The air required for

both purposes can be regulated to a nicety, making it possible to maintain ideal furnace conditions for the most economical consumption of all grades of coal.

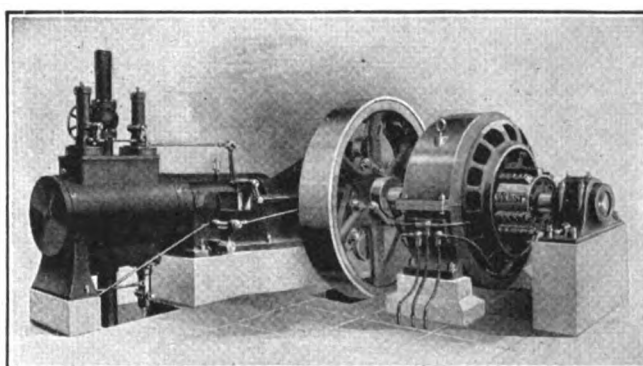


ERIE CITY PULVERIZED COAL APPARATUS

Each installation of Pulverized coal equipment presents features peculiar to itself, and our engineers are available and ready to give the requirements of interested parties careful consideration, and recommend the necessary equipment to suit the conditions.

Erie City "Lentz" Engines

Under the American rights secured, this company is now manufacturing the "Lentz" engine—a reciprocating engine designed for the use of superheated steam



"LENTZ" ENGINE

at high pressures and proved by experience, since 1899, to be the *most economical* prime mover that can be used. Now used in almost every line of manufacture.

Special Features—Steam regulation is accomplished by varying a cut-off through a shaft governor and straight-shot eccentric instead of by throttling. Cylinders and beds made simple and compound, condensing or non-condensing, to meet conditions. Valves are of double seated poppet type, and are each actuated by a cam working on a roller running at side of engine. No elastic packing throughout engine, special cast iron rings being used in stuffing boxes, etc.

Full particulars sent on application.

HEINE BOILER CO.

5330 Marcus Avenue
ST. LOUIS, MO.

BRANCH OFFICES

NEW YORK, N. Y., 11 Broadway
CHICAGO, ILL., First National Bank Building
PHILADELPHIA, PA., Pennsylvania Building
CINCINNATI, OHIO, Union Trust Building

CLEVELAND, OHIO, Schofield Building

PITTSBURGH, PA., Park Building
BOSTON, MASS., 50 Congress Street
NEW ORLEANS, LA., Godchaux Building
DETROIT, MICH., Dime Bank Building

AGENCIES

DENVER, COLO., STEARNS-ROGERS MFG. CO.
SAN FRANCISCO, CAL., DORWARD ENG. CO.
DALLAS, TEX., SMITH & WHITNEY

CALCUTTA, INDIA, ATKIN AND DUFF ENGINEERING CO.

CHARLOTTE, N. C., ALEXANDER & GARSED
HAVANA, CUBA, OSCAR B. CINTAS
YOKOHAMA, JAPAN, TAKATA & CO.

Products

HEINE BOILERS: Longitudinal-Drum, Cross-Drum, Marine, and Waste-heat.

Also manufacturers of Steel Stacks, Housings, Flues, etc.

Experience

For more than 40 years the HEINE BOILER CO. has been building water-tube boilers. During that time it has developed a plant and personnel thoroughly equipped and experienced in the design, manufacture, erection and operation of boilers. Heine boilers are built in two large modern plants, one in St. Louis, Mo., and the other in Phoenixville, Pa.

Superiority of Heine Boilers

Time has proved that the fundamental principles of the Heine boiler are right, and performance and service have demonstrated that the mechanical construction is second to none. All Heine boilers more than meet the requirements of the A. S. M. E. Boiler Code.

Heine boilers are built for hard driving and can be counted on for 300% rating with very little sacrifice in efficiency.

Heine Straight-tube Boilers

Two types of Heine straight-tube boilers are made, the longitudinal drum and the cross drum. Both of them are remarkable for their efficient use of space. The cleaning of these boilers is extremely easy, especially when horizontal baffles are used.

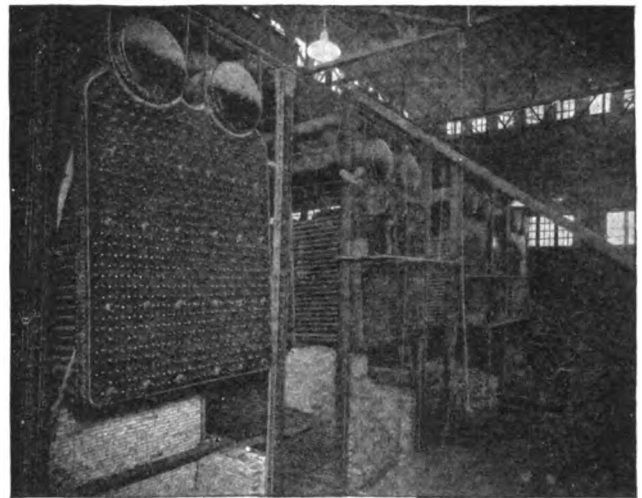
In both boilers an internal mud drum is installed within the main drum, so that the incoming feed water is heated to the boiler temperature before it enters the circulation path. Consequently, practically all sediment is deposited in this drum, where it can be blown off before it has an opportunity to enter the working parts of the boiler.

Both types of boiler may be equipped with either vertical, diagonal or horizontal baffles, depending upon the operating conditions. Horizontal baffles have the advantage of flexibility, due to the ease with which they can be changed to fit particular requirements. Also, they are easier to clean and keep in perfect condition, as they can be inspected and cleaned from the front and rear.



TRADE-MARK

The choice between these two types of boilers is largely a matter of personal preference. However, practice seems to indicate a preference for the longitudinal drum in industrial power plants, and the cross drum in large-unit central station plants.



HEINE WASTE-HEAT BOILERS IN PROCESS OF INSTALLATION

Heine Waste-heat Boilers

In the operation of certain industrial furnaces, such as rotary cement kilns, open-hearth steel furnaces, malleable iron melting furnaces, oil stills, coal-gas benches, glass melting furnaces, etc., the thermal efficiency of the primary furnace can be increased by utilizing in a waste-heat boiler the heat units which normally are lost in the escaping gases. The steam thus generated by a waste-heat boiler represents a direct saving in the fuel used for steam generation under direct fired boilers.

Heine straight-tube boilers of special design are built for this service. However, as there are so many modifying conditions affecting the proper design of boilers of this type, such as raw materials, fuel, operating characteristics of the primary furnace, etc., each installation requires individual study to determine the feasibility of the plan and the best methods of application.

Engineering Service—The Engineering Department of the HEINE BOILER CO. is at the service of those having industrial furnaces with exhaust gases that are capable of being utilized.

INTERNATIONAL ENGINEERING WORKS, INC.

Boilers, Grates, and Steel Plate Construction

GENERAL OFFICES AND WORKS
FRAMINGHAM, MASS.

BRANCH OFFICES

BOSTON, MASS.

PHILADELPHIA, PA.

NEW YORK, N. Y.

CHARLOTTE, N. C.

Products

SCOTCH BOILERS; WATER TUBE BOILERS; TUBULAR BOILERS; SHAKING GRATES; BOILER DOOR PROTECTORS; STEEL PLATE CONSTRUCTION.

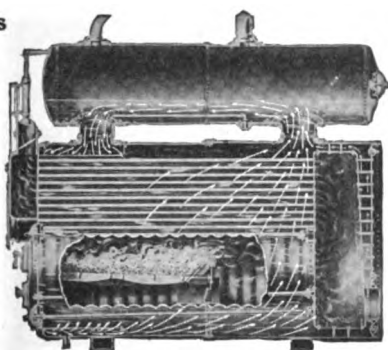
Engineering Service

The engineering department of this organization has accumulated much valuable data during many years of successful experience in the construction of boilers and steel plate work, and will gladly co-operate in solving difficult problems involving special requirements.

Recommendations and estimates will be furnished promptly on receipt of the necessary information.

Brady Scotch Boilers

The Brady Scotch boiler combines the advantages of internal firing and self-contained construction, while overcoming all possible objections by providing positive rapid circulation without a special pump or other device.



BRADY SCOTCH BOILER

Complete information sent on request.

Water Tube Boiler

Our water tube boiler is of the horizontal cross drum type. A distinctive feature is the location of two horizontal cross drums and headers at the front and rear of a brick setting, connected by an inclined bank of circulating tubes.

The drums are also connected by a series of superheating tubes that carry the steam from the front to the rear drum where it leaves the boiler. This design assures dry steam.

Vertical Tubular Boilers

Manning Type—Perfectly adapted to all requirements of the highest pressures and the largest units.

One of the best boilers to use with turbines as it ordinarily furnishes steam superheated 25° to 30°, which may be increased by lowering the water line or by the use of longer tubes.

It is suitable for any locality, regardless of water conditions, as it is provided with ample facilities for cleaning and inspection. Occupies less floor space per horsepower than other types of boilers.

Other Types—Straight shell and tapered course types of vertical tubular boilers are also built.



MANNING VERTICAL TUBULAR BOILER

Horizontal Return Tubular Boilers

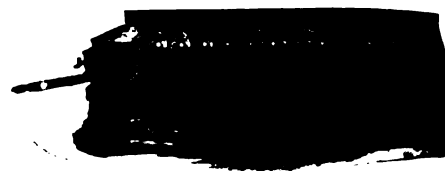
Constructed in full compliance with the requirements of the A. S. M. E. boiler code in units up to 300 h. p.

Furnished with stationary or shaking grates, and with wall brackets or suspension lugs, depending on the type of setting desired. Standard steel casings can be provided where the conditions demand a compact setting and highest efficiency.

Macdonald Shaking Grates

These grates have unrestricted air passages and foolproof locking device. They are easily repaired, at slight expense, by simply replacing detachable top sections, which may be changed to give any desired air opening or spacing of the grate.

The use of these grates materially increases the boiler efficiency through more perfect combustion of the fuel which can not be wasted by shaking.

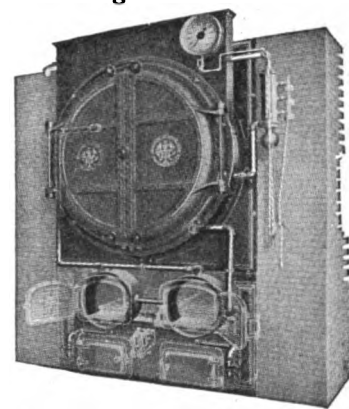


MACDONALD SHAKING GRATE
Side supporting bar removed and operating lever thrown down

Smith Boiler Door Protectors

Smith door protectors are made of firebox steel and eliminate entirely the use of the customary fire brick arches and cheeks, and the standard cast iron dead plate employed in the setting of both horizontal return tubular boiler and water tube boiler.

The circulation carries water from the boiler to the protector and back to the boiler, and reduces the temperature around the door openings. Frequent and oftentimes expensive repairs to the furnace walls are thereby eliminated and the operating efficiency of the boiler is greatly improved.

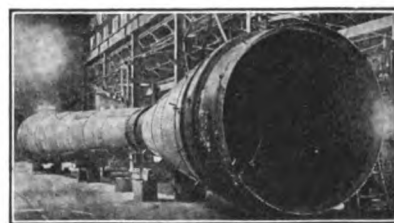


SMITH BOILER DOOR PROTECTORS

Steel Plate Construction

Steel plate construction of every description for all industries, fabricated from this company's own designs or in accordance with purchaser's specifications.

Our plant is thoroughly equipped to handle the most difficult forms of steel plate construction efficiently and has exceptional shipping facilities.



VENTURI TUBE

ESTABLISHED 1864

E. KEELER COMPANY

Manufacturers of Water Tube and Return Tubular Boilers

WILLIAMSPORT, PA.

BRANCH OFFICES

NEW YORK, N. Y.
BUFFALO, N. Y.PHILADELPHIA, PA.
BOSTON, MASS.CHICAGO, ILL.
PORTLAND, ORE.PITTSBURGH, PA.
RICHMOND, VA.NEW ORLEANS, LA.
RICHMOND, VA.**Products**

WATER TUBE BOILERS; RETURN TUBULAR BOILERS.
Built to A. S. M. E. Rules.

Standard Keeler Water Tube Boiler

The arrangement of furnace, tubes, headers and drums is correct, accessible and compact. The superior efficiency of the Keeler boiler rests upon correct proportions of heating and grate surface for the character of fuel to be burned, ample height of furnace, superior arrangement of baffle walls and perfect circulation.

Every portion of the heating surface is accessible for both external and internal inspection, making it impossible for soot or scale to accumulate undetected.

Wrought steel is used for every part of the boiler under pressure. This is the first requirement of reliability.

All tubes are straight. Boilers with bent tubes are accepted only as a compromise. Bent tubes are harder to keep clean and the interior can not be inspected. In the standard type all tubes are 4 in. in diameter and 16 or 18 ft. long. This is a standard carried in stock by dealers everywhere. A 4-in. tube is stiffer than a 3½-in. tube in the ratio of 1.52 to 1.04 (their section moduli); 3½-in. tubes sag and leak at the headers, 4-in. tubes do not.

The Keeler boiler is provided with vertical baffles. These support the tubes instead of being a dead weight. Vertical baffles insure a more perfect distribution of gases, need no repairs and do not collect soot.

The wrapper sheet in the header is flanged and the header sheet straight. A wrapper, being small, can be flanged at one operation; while to flange a header it is necessary to heat it several times. This has a tendency to crystallize the metal and cause internal strains.

The Keeler boiler has its steam outlet at the center of a horizontal drum. This is out of the way of the violent agitation at the front header and insures dry steam.

The distance between the center line of tubes and underside of drum in Keeler boilers is 10¾ in. in front and 26½ to 28½ in. in rear. This large space between the drum and tubes gives ample room for expansion and contraction, without throwing strains on the throat connection. It also affords space for superheaters and facility for inspection of all parts of the drum.

Keeler boiler has a substantial and workmanlike flush front. This means there is no projection for the

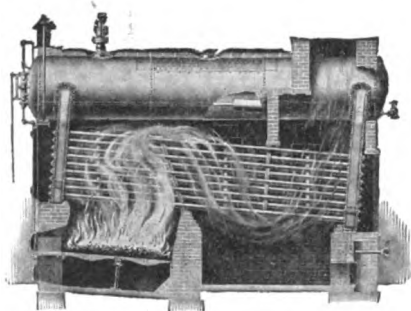
fireman to come in contact with in coaling the boiler or cleaning the tubes.

The method of supporting the boiler meets the requirements of the most exacting specifications.

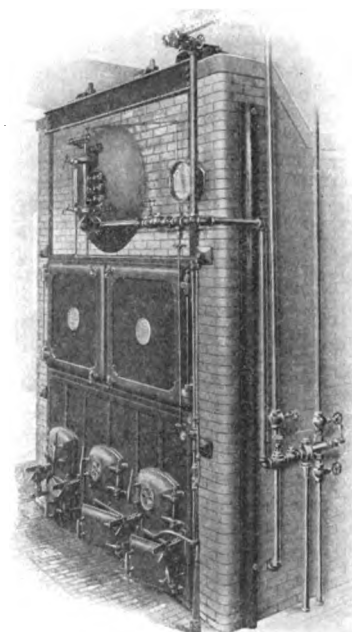
In the Keeler boiler the blow-off is in the bottom wrapper sheet of the rear header. The design is such that there are no obstructions of any kind; dirt and sediment are drawn from the boiler by gravity.

The rear header of the Keeler boiler is covered with a steel casing, supported by structural steel frame. This keeps the cold air away from the header.

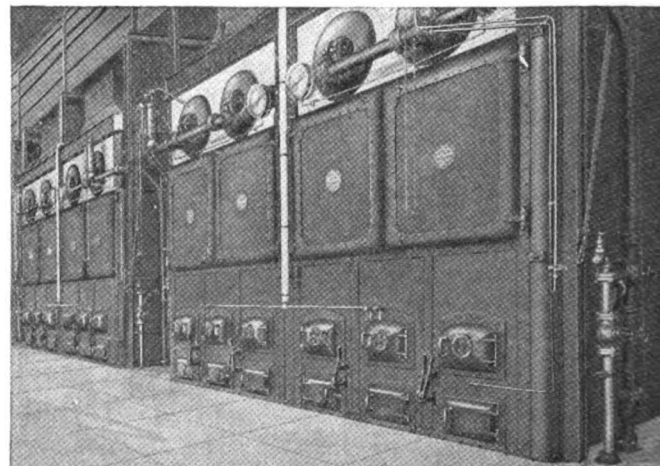
Unless otherwise specified, solid staybolts are used, with test holes drilled in each end. Where hollow staybolts are used a certain amount of cold air is admitted into the boiler setting. Hollow staybolts must be plugged. These plugs are seldom kept in place and have to be frequently replaced, which is an expense.



STANDARD WATER TUBE BOILER
Built in units from 75 to 1000 h.p.



WATER TUBE BOILER, UNITED STATES
BUREAU OF STANDARDS, WASHINGTON, D. C.



TWELVE 410 H. P. KEELER WATER TUBE BOILERS, ISTHMUS OF
PANAMA
Built for the United States Government

The Keeler boiler is cleaned from the side of the setting with a steam blower, through a small opening over each row of tubes.

Keeler Cross Drum Boiler

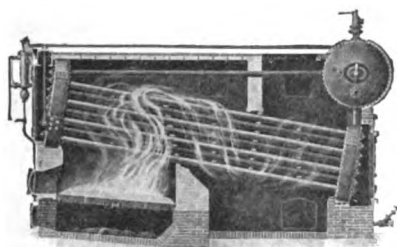
The Keeler cross drum boiler is a modification of the standard design only in the length and location of the drum and the method of connecting it to the headers.

This type was designed to meet the demand for a high pressure water tube boiler that could be installed in office buildings, schoolhouses, churches, apartment houses, hotels, and in boiler rooms generally where ceiling height is limited, or where boilers must be introduced through narrow passageways or restricted openings.

This type is in use in many of the new public schools in Philadelphia, in the Sheffield Scientific School, New Haven, Conn., and is used by the United States Government.

This boiler is shipped knocked down, and will appeal especially to architects and heating and ventilating engineers as a logical water tube boiler for their requirements.

Ask for new Water Tube Catalogue.



CROSS DRUM BOILER
Built in units from 60 to 600 h. p. Especially adapted for schools, etc., where there is lack of headroom

Keeler Tubular Boiler

The Keeler tubular boiler embodies all this organization has learned of boiler building in 58 years. Every boiler which leaves the shop is regarded as a pledge of good faith.

The Keeler full flush front is of heavy, substantial design. All doors have a deep flange or roll. This feature prevents warping or cracking of edges and gives the front a rich and handsome appearance. Fire doors are of an extra heavy deep pattern, with a liberal space between the door and the perforated liner which preserves both castings. Fire doors close against inclined seats, so that they never stand away from the front. There is provision for expansion above the fire doors, which absolutely prevents cracks in the front at the corners of the openings under all ordinary conditions of service. All doors and seats are carefully fitted to a close bearing and all fronts are assembled complete before shipment. The top of the front is finished with a handsome cornice.



RETURN TUBULAR BOILER
Built in units from 40 to 300 h. p.

The chief difference in the same type of boiler is the time and attention given to details. That is why one boiler costs more than another, where specifications are practically the same. If a cheaply constructed tubular boiler is bought it may have to be removed in a short time. Do not run the risk of having to charge off as a total loss the money spent for freight, hauling, labor, brick setting and erecting the stack. A cheap, carelessly constructed boiler entails the same expense for freight, installation and other requirements as the most reliable boiler that can be built.

Material and Workmanship

All Keeler boilers are guaranteed to pass the inspection of any established boiler insurance and inspection company for the pressure specified.

References

Fifty-eight years of boiler building without a shut-down or an explosion is the reputation gained by this company.

Following is a partial list of users of Keeler boilers:

WATER TUBE INSTALLATIONS

NAME	LOCATION	NUMBER
Bureau of Engraving & Printing	Washington, D. C.	2-500 h. p.
Cook County Hospital	Chicago, Ill.	4-500 h. p.
Citizens Gas & Electric Company	Waterloo, Iowa	5-600 h. p.
Watertown Arsenal	Watertown, Mass.	8-150 h. p.
New York Shipbuilding Co.	Camden, N. J.	12-400 h. p.
Clifton Springs Distillery Co.	Cincinnati, Ohio	3-600 h. p.
P. Ballantine & Sons	Newark, N. J.	4-500 h. p.
Luzerne County Gas & Electric Co.	Plymouth, Pa.	9-500 h. p.
United States Government	Old Hickory, Tenn.	5-500 h. p.
Penn Public Service Co.	Johnstown, Pa.	8-500 h. p.
City of Fort Worth, Texas		3-500 h. p.
Keystone Steel & Wire Co.	Peoria, Ill.	3-500 h. p.
Quidnick-Windham Mfg. Co.	Quidnick, R. I.	2-300 h. p.

RETURN TUBULAR INSTALLATIONS

Philadelphia & Reading Coal & Iron Co.	Shamokin, Pa.	10-150 h. p.
Bordens Condensed Milk Co.	New York, N. Y.	28-150 h. p.
Helvetia Milk Condensing Co.	Highland, Ill.	12-150 h. p.
Atlantic Pulp & Paper Co.	Port Wentworth, Ga.	4-250 h. p.
Great Southern Lumber Co.	Bogalusa, La.	24-175 h. p.
American Cotton Duck Co.	Baltimore, Md.	7-150 h. p.
Poole Engineering Co.	Baltimore, Md.	4-200 h. p.
Deemer Mfg. Co.	Philadelphia, Miss.	6-175 h. p.
E. Pritchard	Bridgeton, N. J.	6-150 h. p.
Newark Box Board Co.	Newark, N. J.	4-200 h. p.

TESTS OF KEELER WATER TUBE BOILERS

Location	Gatun Handling Plant, Gatun Locks, C. Z.	United States Bureau of Standards, Washington, D. C.	Davis Coal & Coke Co., Thomas, W. Va.	Bureau of Engraving & Printing, Washington, D. C.
Engineer.....	Testing Dept. Mechan. Div.	S. Franklin Gardner	Mechanical Engineer of Co.	G. E. Reed & McRae Parker
Kind of fuel.....	Pocahontas coal run of mine	Anthracite, No. 1 buckwheat	Semi-bituminous	Semi-bituminous
Kind of furnace.....	Hand fired Ajax shaking	Hand fired Ajax shaking	Jones stoker	Crowe stoker
Grate surface, sq. ft.....	68.5	63	80	80
Heating surface, sq. ft.....	4089	2526	5040	5018
Duration of trial, hrs.....	10	18	8	18
Wt. coal as fired, lbs.....	16,811	19,380	13,125	47,250
Per cent of moisture in coal.....	4.17	6.6	5.8	6.1
Wt., dry coal, lbs.....	16,110	18,101	13,059	44,368
Wt., ash and refuse, lbs.....	283.5	4904	3018	2434
Percentage ash in dry coal.....	1.76	27.00		
Total water, lbs.....	163,744	130,772	123,891	432,750
Water evaporated, corrected for moisture, lbs.....	superheated	130,249	122,652	428,721
Factor evaporation.....	1.1378	1.2168	1.0611	1.1867
Equivalent evaporation from and at 212° F., lbs.....	186,308	158,487	130,146	509,950
Dry coal per sq. ft. grate per hour, lbs.....	23.52	15.96	20.39	32.8
Equivalent evaporation per sq. ft. of heating surface per hour, lbs.....	4.55	3.48	3.22	5.65
Steam pressure, lbs.....	193.24	121.05	147.4	123.16
Temperature of feed water, deg. F.....	189.5	42.8	197	72.29
Temperature of escaping gases, deg. F.....	488.62	461.57	481	528
Draft in uptake, in.....	.836	.878	.79	.908
Per cent of moisture in steam entering superheater.....	1.336	.004	1	.865
No. of deg. of superheat.....	106.81	0	0	0
Developed h. p.....	640	255	472	822
Rated h. p.....	410	253	500	500
Percentage of rated h. p. developed.....	131	100.7	94.4	164
Equivalent evaporation from and at 212° F. per lb. dry coal.....	11.56	8.755	9.34	11.58
Equivalent evaporation from and at 212° F. per lb. combustible.....	11.77	12.01	12.20	12.29

KINGSFORD FOUNDRY AND MACHINE WORKS

Manufacturers of Boilers and Engines

MAIN OFFICE AND WORKS

OSWEGO, N. Y.

Products

BOILERS: Sectional Water Tube; Stationary and Heating of all kinds; Marine and Locomotive type.

ENGINES: Vertical and Horizontal Una-flow.

Also manufacturers of Centrifugal Pumps of all types.

Kingsford-Webster Boiler

Construction—This boiler is of the well-known sectional, sinuous header, water tube type, and is built in both longitudinal and cross drum styles.

The A. S. M. E. code is the standard according to which we build and, in addition, we conform to the state laws wherever boilers are to be installed.

insures contact of an equal volume of hot gases, and the transference of equal amounts of heat to each tube.

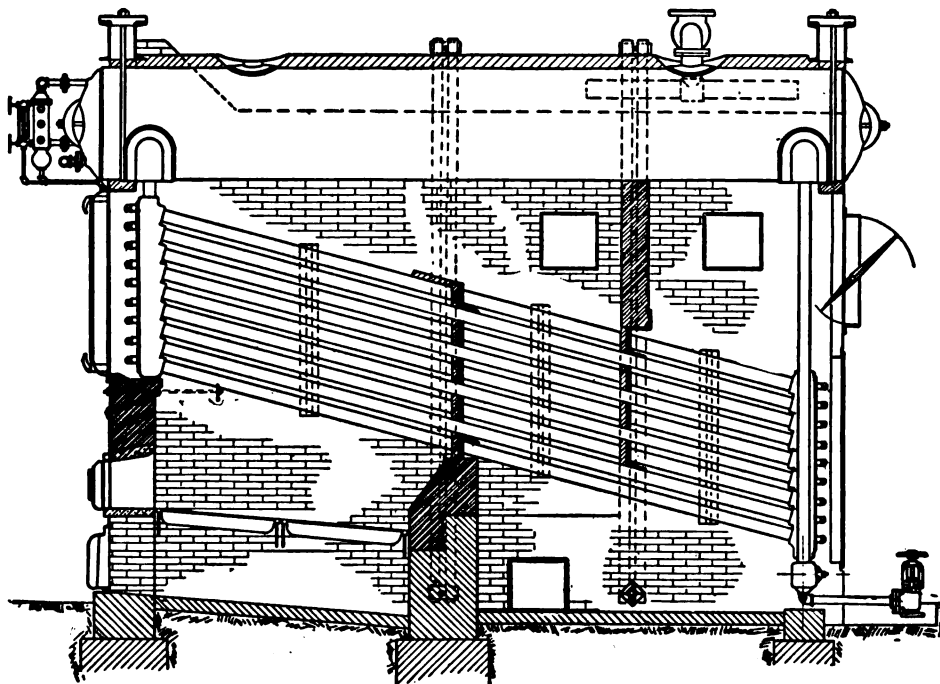
Headers Uniform in Thickness—Surplus metal added to allow for machining losses.

The *equalizing tubes* insure a large supply of water to the lower rows of tubes.

Front and rear columns flush with the outside walls of the boiler minimize the danger of corrosion at the base.

The design is readily adapted to superheat, mechanical stoking or oil burning.

The boiler is suspended on a steel frame independent of the brickwork.



LONGITUDINAL SECTION OF KINGSFORD-WEBSTER SECTIONAL WATER TUBE BOILER—
LONGITUDINAL DRUM TYPE

Features—All-steel construction.

The 15-degree pitch of the tubes causes rapid circulation:

Rapid circulation gives rapid heat transference, increases the rate of evaporation, allows less scale to form, and prevents dirt from accumulating.

The *uniform stagger* of the *tubes* prevents constricted areas for the accumulation of soot and dirt,

Easy access to the tubes for cleaning or removal.

The sections are individually suspended.

The *cross boxes* are uniform in thickness.

Catalogues—Send for catalogues and full information.

Kingsford Una-flow Engines

The accompanying illustration shows a high speed vertical engine for small generator drives, and for driving fans, stokers, etc.

It is extremely economical in the use of steam and can be run condensing or non-condensing. It is built for 200 lbs. pressure with or without superheat.

The vertical engines for large powers are built in single and multiple cylinder units.

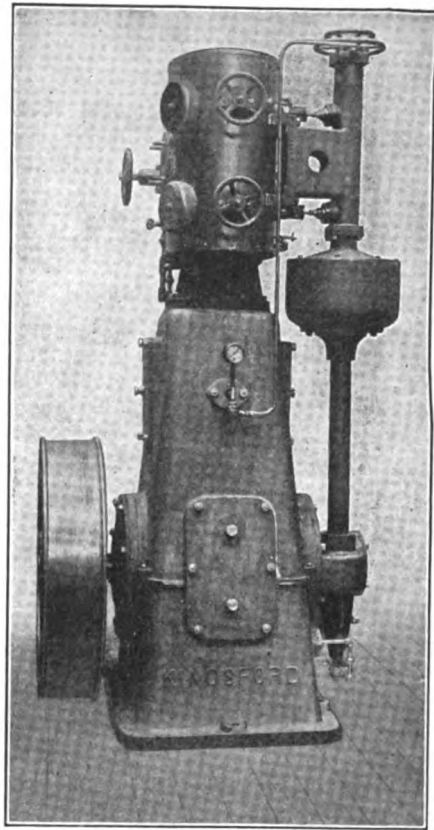
A single cylinder unit will develop about 80 indicated horsepower at 450 revolutions.

The engine is built of high grade material throughout and equipped with a forced feed oiling system.

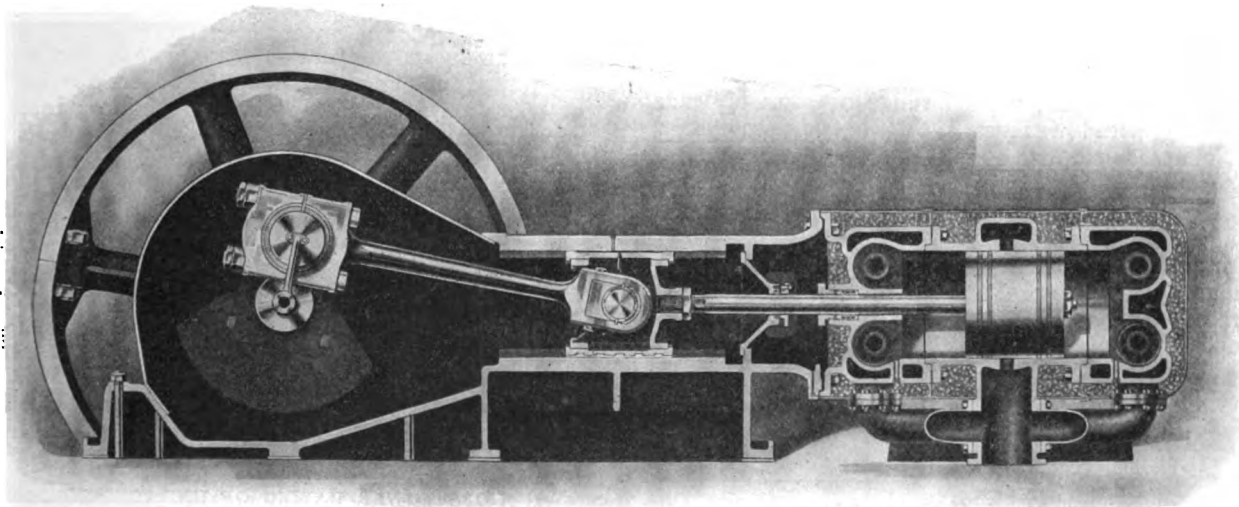
Briefly, the advantages of the Kingsford Una-flow engines are their simplicity, high efficiency and reliability, together with close speed regulation.

The illustration shows the Kingsford horizontal Una-flow engine, which can be built in all sizes, for all conditions of steam and exhaust adapted for driving a generator, blower, compressor, etc. For variable load and speed work, the governing device is extremely simple, rugged and at all times has the engine under perfect control.

For non-condensing service the engine is equipped with four valves, condensing two valves, doing away with the so-called automatic devices for controlling the compression, as these devices are more or less a source of trouble and annoyance.



KINGSFORD UNA-FLOW HIGH SPEED VERTICAL ENGINE



KINGSFORD UNA-FLOW HORIZONTAL ENGINE

LEBANON BOILER WORKS

J. K. PETTY & CO., INC., PROPRIETORS

6 South 15th Street

PHILADELPHIA, PA.

SELLING REPRESENTATIVES IN THE PRINCIPAL CITIES AND FOREIGN COUNTRIES

WORKS: LEBANON, PA.

Products

Designers, manufacturers and erectors of BOILERS. Also, Boiler Water Cleaners; General Plate Work.

Uniflow Improved Return Tubular Boiler

This modern horizontal return tubular boiler is patented in the United States and foreign countries. Authoritative records show that after more than 50 years of universal service many more return tubular boilers are being made for steam power purposes than any other type. It has stoically overcome all kinds of abuse.

Uniflow Return Tubular (Circulating) vs. Old Return Tubular (Contraflow)

A 60 in. x 18 ft. Uniflow boiler, while working easier, will develop more horsepower than a 72 in. x 18 ft. old return tubular.

The two Uniflows shown in Fig. 1 have more capacity than three old return tubular boilers of the same dimensions. The space left over is reserved for a future Uniflow, although it could be otherwise utilized.

While maintaining the same simplicity of construction and all the other advantages of the time honored return tubular type of boiler, the Uniflow, augmented with its positive circulation, secures more horsepower and forges way ahead in compactness, responsiveness, overload capacity, dry steaming, constant water level, efficiency, consistent design, range of sizes and adaptability—all with lower installation, maintenance and operating costs.

Uniflow boilers operate at 74% or higher efficiency continuously. Old return tubular boilers average 57% (United States Government reports).

Uniflow tubes are 1 1/4 in. apart—old return tubulars 1 in.

A nozzle for each tube keeps the Uniflow heating surface clean (Fig. 2).

One prominent Uniflow user (a College) writes:—

Your Uniflow setting has proved to be all you claimed for it. It is air-tight, no cracks have appeared and it is in as good shape as when first installed, despite some hard usage which the boilers have received.

Uniflow Return Tubular versus Water Tube Boilers

Uniflow return tubular boilers are much safer than water tube boilers and contrary claims misrepresent recorded facts. No multiple-ring, butt-strapped return tubular boiler has ever been known to explode, as have water tube boilers by the hundreds.

Uniflow boilers cost less per horsepower installed, are cheaper and easier to operate and require much less floor space. They excel in plain, rugged construction,

accessibility for cleaning and repairs, compactness (Fig. 3) and adaptability.

Uniflow circulation is twice its height. Water tube circulation is twice its height, plus twice its length. Uniflow boilers are more responsive, maintain a constant water level, do not prime and have no soot losses.

The outside of water tubes foul with soot and fire scale (Fig. 4) which can never be effectively cleaned off. Consequently water tube boilers test 71% to 74% efficient when new—but after a year's service they operate at from 48% to 65%, due to unavoidable soot losses.

Another well-known thoroughgoing Uniflow user (a Steel Works) writes:—

We have a 500-h.p. water tube boiler whose full capacity is 3 steamhammers, while our 313 h.p. Uniflow's capacity is 4 steamhammers.

Uniflow Performance is Guaranteed

Uniflow saves from 15% to 25% in fuel over both old return tubular and water tube boilers for every year of operation after the first year. Uniflow installations comprehend high efficiency boilers, high efficiency furnaces, smokeless combustion, airtight settings. They are well adapted to superheating.

The Uniflow stack is designed to last as long as the boiler. It is made self-supporting or guyed and requires no additional floor space.

Uniflow is a simple, standardized design, meeting all conditions of installation, such as low headroom; any kind of breeching take-off, side and rear alleys not essential, etc., but always there is more horsepower, maximum sustained economy for the life of the installation, least maintenance and lower first cost in Uniflow—The Modern Boiler.

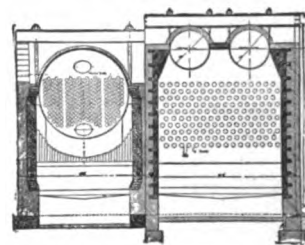


FIG. 3
313 H.P. STANDARD UNIFLOW BOILER
300 H.P. STANDARD WATER TUBE BOILER

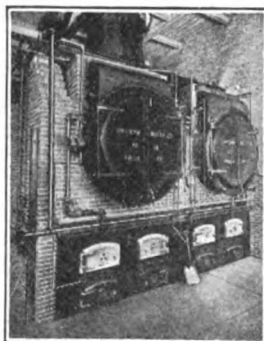


FIG. 1. UNIFLOW INSTALLATION

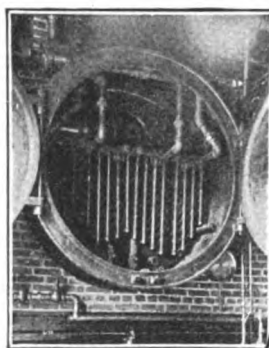


FIG. 2. SHOWING TUBE NOZZLES

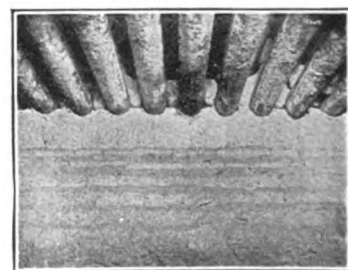


FIG. 4. A MILD CASE OF FOULING

HORSEPOWER RATING OF UNIFLOW BOILERS

Boiler No.	Horsepower	Boiler dimensions, in.		No. of 3 in. tubes	Boiler No.	Horsepower	Boiler dimensions, in.		No. of 2 1/2 in. tubes
		Diam.	Length				Diam.	Length	
*A-1	134	60	16	96	B-3	50	36	14	47
*A-2	151	60	18	96	B-6	67	42	14	64
*A-3	155	66	16	111	B-9	75	48	14	71
*A-4	174	66	18	111	*B-12	102	54	14	100
*A-5	193	66	20	111	*B-15	123	60	14	121
*A-6	192	72	16	140	*B-18	153	66	14	152
*A-7	216	72	18	140	*B-21	181	72	14	181
*A-8	240	72	20	140	B-24	214	78	14	216
*A-9	230	78	16	169	B-27	267	84	14	272
*A-10	259	78	18	169					
*A-11	287	78	20	169					
*A-12	313	84	18	206					
*A-13	347	84	20	206					
*A-14	386	90	18	256					
*A-15	428	90	20	256					
*A-16	440	96	18	293					
*A-17	488	96	20	293					

*Denotes stock sizes, 150 lbs. working pressure A. S. M. E. Standard.

Other sizes built special.
50% overload capacity guaranteed.

PAGE BOILER COMPANY

815-819 Larrabee Street
CHICAGO, ILL.

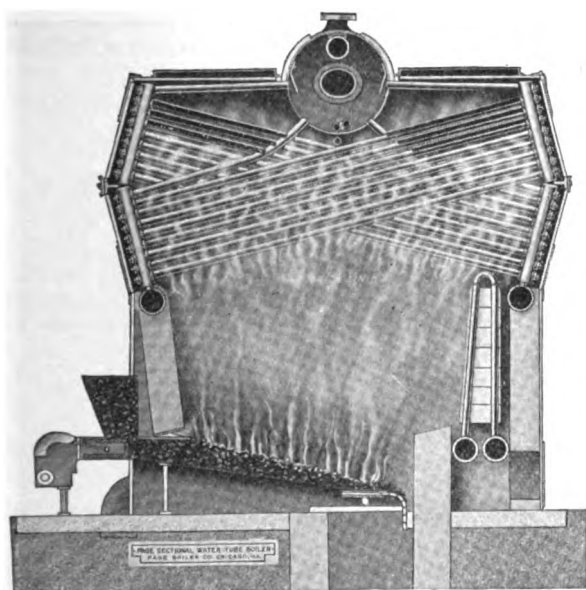
Product

PAGE TWIN WATER TUBE SECTIONAL BOILER.
(Patents pending.)

General Construction

The Page Boiler consists virtually of two boilers in one. Half of the sections are arranged diagonally across the boiler in one direction and the other half in the opposite direction. Thus the heat passages are split up horizontally and vertically, causing more frequent contact of gases from tube to tube.

There are no "baffles" in the ordinary sense, the tubes themselves taking the place of the baffles of ordinary boiler types. The Page accomplishes as much in its one and only pass as other types accomplish through the use of extensive baffling and three passes. Gases extend under entire heating surface. Proportion of grate surface to heating surface is liberal. Rated horsepower is easily developed with 13 lbs. of good coal per square foot of grate per hour.



SIDE ELEVATION OF PAGE BOILER, STOKER FIRED

Compactness

Compactness is due to the cross tube system and to the elimination of brick walls. Since the Page is in effect two boilers in one, capacity in horsepower per cubic foot of space is practically twice as great as that of any other boiler.

Enclosure

Entirely enclosed in an airtight steel casing which is insulated with 4 in. of non-conducting asbestos and lined with fire brick. This wall so effectively insulates the furnace that the hand may be put on any part of the casing without discomfort.

Accessibility

Design and construction provide every convenience for inspection, cleaning, and repair.

Efficiency

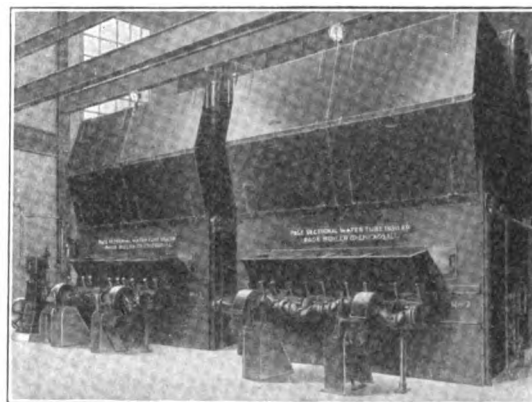
The efficiency of the Page Boiler frequently runs from 72% to 75%. This high efficiency is due to the 2-in-1 boiler construction, the airtight enclosure, and the built-in oscillating soot blower which will blow the section in one minute and which does away altogether with soot accumulation. This soot blower is regular equipment of all Page Boilers.

Sediment Removal

All sediment can be quickly blown from the boiler. Removal of header plates is not necessary. A Page can be blown down, cooled off, and washed out in half the time required for boilers having brick settings.

Expansion

Each section is free to expand independently of other sections. Each section has a separate water feed from upper drum and contains a separate intake to steam drum. These separate water feeds produce a most efficient and strong steaming boiler. A positive circulation assures that all pressure parts will be at the same temperatures at all times, preventing strains which result from unequal temperatures in many types of boilers.



TWO OF FOUR 500-H.P. PAGE BOILERS INSTALLED AT CHICAGO WASTE DISPOSAL POWER PLANT

Utilization of Waste Heat

Page Boilers, in service as waste heat boilers, have shown evaporations of 15% to 20% more than other types.

Marine Boilers

Due to its light weight per horsepower and its compact construction the Page Boiler has been used very successfully in marine service.

The new Page catalogue describes the boiler in greater detail and gives views of some of the many prominent installations.

UNION IRON WORKS

Manufacturers of Steam Boilers and Steel Plate Construction
ERIE, PA.

BRANCH OFFICES AND AGENCIES

BOSTON, MASS., STARKWEATHER & BROADHURST, 53 State Street
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SYRACUSE, N. Y., CHAS. F. WAYTE, 918 University Building
INDIANAPOLIS, IND., DRAYO-DOYLE Co., Merchants Bank Building
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CLEVELAND, OHIO, 550 Rockefeller Building
TOLEDO-DETROIT, W. HAWLEY & Co., Nicholas Building, Toledo, Ohio
CHICAGO, ILL., 330 Old Colony Building
SAN FRANCISCO, CAL., PAUL COOP, Hobart Building

Products

UNION WATER TUBE BOILERS; UNION HORIZONTAL RETURN TUBULAR BOILERS.

Also manufacturers of all types of Fire Tube Boilers, Vertical, Internally Fired, Scotch, and Locomotive, as well as Portable Boilers, Stacks, Tanks, Breechings, etc.



PLANT OF THE UNION IRON WORKS

Water Tube Boilers

Over thirty years' experience in high pressure steam boiler building has produced the Union water tube boiler. There are more distinctive features in its design which make for continued efficiency, high overload capacity, safety, and minimum cost of operation and maintenance than in any other water tube boiler. Among these advantages may be mentioned the following:

The patented corrugated flange connection from drums to headers eliminates distortion of tubes and leaky headers. There are no restricted areas, thus free circulation is assured and internal strains are relieved in the boilers.

The patented purifier in the drums takes out practically all of the impurities in the feed water before it comes in contact with the heating surfaces. Settling chamber is out of range of the fire and path of circulating steam making element. Fitted with separate reinforced blow-off connection.

The horizontal drums provide ample steam and water space and steam liberating surface. Large area of connection from drums to header allows unrestricted circulation. This insures dry steam and large water storage capacity, permitting high overload.

The shape of the handhole permits each steel plate to be withdrawn through the hole it covers. No ground joints are used and plates are easily kept tight. The yoke is of novel design, readily and quickly removed.

The tube spacing and purifier permit keeping the boiler clean while in operation. These features reduce the labor for cleaning and the time lost while boiler is out of service. There is both higher operating efficiency and greater overload capacity than in any other boiler on the market.

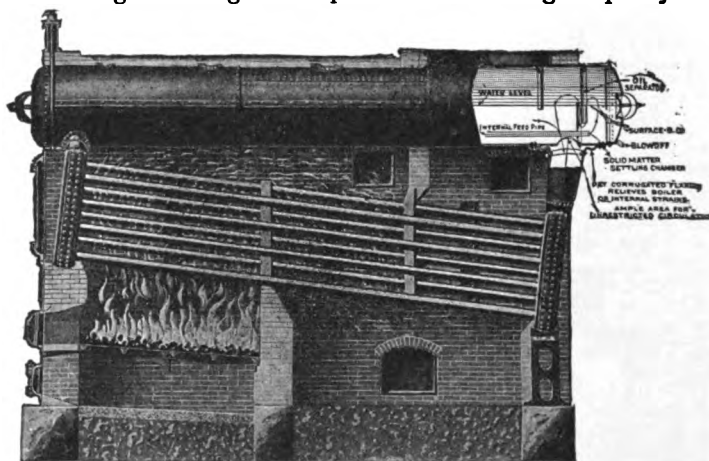
The headers are made in integral halves in one heat and operation. The water space is of unusual depth

and the headers have at no point two thicknesses of plate or rivets in the fire.

We have never had a broken staybolt in the Union water tube boiler. The water content of these boilers is exceptionally large and practically the same as for return tubular boilers of the same horsepower rating. Regular pitch of staybolts and additional blow-off at bottom of the headers.

The greater inclination of the tubes promotes more rapid circulation. They are vertically staggered to expose the maximum area to the heat. The horizontal spacing in rows is to permit inspection and proper cleaning of the fire side of the boiler. It also furnishes ample room for the passage of gases. All tubes are straight, of the same length and standard diameter.

The standard vertical baffles permit the installation of any regular superheater, as well as mechanical soot blowers. Horizontal baffles, however, may be fitted, as tube spacing arranged for them. Products of combustion pass through ample spaces between tubes and baffles, making at least three passes and then are discharged through the uptake areas of large capacity.



UNION WATER TUBE BOILER

The workmanship is guaranteed to be the very best that can be done by a well trained organization, with modern facilities.

All boilers are inspected and put to hydrostatic and steam tests, and passed only when found to be absolutely tight under the highest allowable working pressures, in compliance with boiler laws and insurance company requirements.

Horizontal Return Tubular Boilers

The Union horizontal return tubular boilers are of standard designs and have the highest reputation for quality of material and workmanship. This line is complete in various types and sizes. A large stock is usually kept on hand for prompt shipment.

HENRY VOGT MACHINE COMPANY

INCORPORATED

Manufacturers of Water Tube and Horizontal Return Tubular Boilers; Oil Refinery Equipment

LOUISVILLE, KY.

NEW YORK, N. Y.

BRANCH OFFICES
CHICAGO, ILL.

TULSA, OKLA.

Products

WATER TUBE and HORIZONTAL RETURN TUBULAR BOILERS.

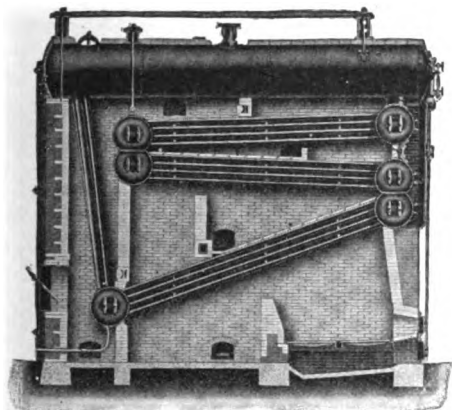
OIL REFINERY EQUIPMENT, including PARAFFIN WAX PRESSES, WAX DISTILLATE CHILLING MACHINES; PRESSURE STILL; SPECIAL WAX PLANT EQUIPMENT.

Also Filter Presses, Agitators, Condenser Boxes and Welded Vessels; Sectional Steel Boiler Casings, Sectional Shaking and Dumping Grates, and Steel Stacks and Tanks.

For Refrigerating Machinery and Drop Forged Steel Valves and Fittings, see page 300.

Vogt Water Tube Boiler

The Vogt water tube boiler is constructed in units varying from 250 to 1000 h.p., and complies in every respect with the boiler code of the American Society of Mechanical Engineers.



VOGT WATER TUBE BOILER

Advantages—The success of the Vogt water tube boiler is built on the following service rendering features:

High efficiency, resulting from design of boiler, arrangement of furnace, counter current circulation between water in tubes and flow of the gases.

Extremely large steam storage space for fluctuating load.

Absence of numerous handholes and freedom of boiler for expansion and contraction.

Easy accessibility for cleaning and inspection.

Ability to "pick up" from dead load to peak load in shortest possible time.

Manufactured by the most advanced boiler shop practice from the highest grade material.

Vogt Horizontal Return Tubular Boiler

Vogt horizontal return tubular boilers are constructed for 125 to 150 lbs. working pressure, and range in capacity from 45 to 250 h.p.

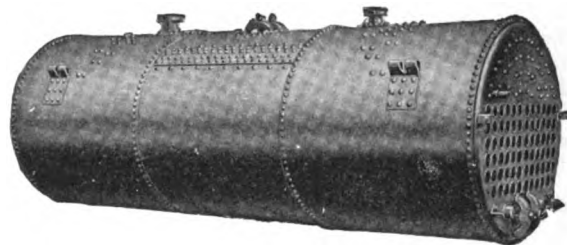
Vogt

TRADE-MARK

The construction complies with the boiler code of the American Society of Mechanical Engineers.

Economy of fuel and high efficiency of the boiler are assured by the large combustion chamber and by ample space between the grates and the bottom of the boiler.

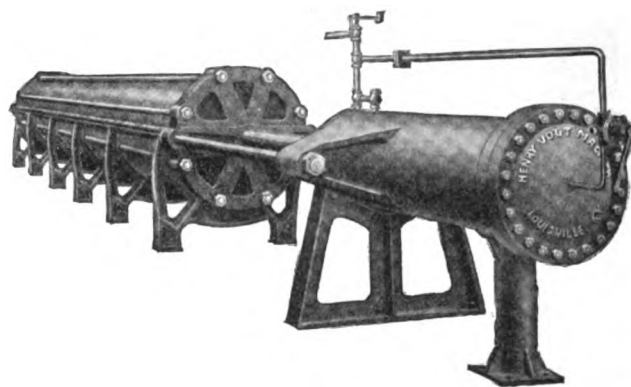
Material and workmanship are of the highest quality.



VOGT HORIZONTAL RETURN TUBULAR BOILER

Vogt Oil Refinery Equipment

Vogt Paraffin Wax Press—Designed for both efficient and economical service in the work of separating the wax from the wax distillate. It is adapted to filter under pressures of 300 to 500 lbs. The plates are made in either the loose ring or the riveted ring type. The press is heavily constructed and the weight evenly distributed. All castings are made of semi-steel.



VOGT PARAFFIN WAX PRESS

Vogt Distillate Chilling Machine—The many installations have proved the excellent working features of this machine. It operates with a minimum amount of power. The distillate pipes (inner pipes) are of wrought iron made in one length. All castings are made of semi-steel.

Vogt Tube Pressure Stills—Comply completely with the specifications for pressure vessels of the American Society of Mechanical Engineers. Special equipment made to order.

THE WALSH & WEIDNER BOILER CO.

CHATTANOOGA, TENN.

BRANCH OFFICES

NEW YORK, N. Y., 11 Broadway
 HAVANA, CUBA, Calle Augiar 71, Dpto 402
 NEW ORLEANS, LA., Canal Commercial Building
 SAN FRANCISCO, CAL., 143 Second Street

MEMPHIS, TENN., Randolph Building
 JACKSONVILLE, FLA., Duval Building
 KANSAS CITY, MO., Reliance Building

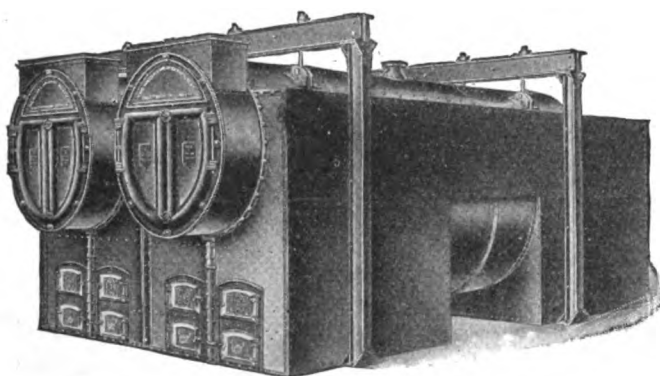
Products

WALSH & WEIDNER HORIZONTAL RETURN TUBULAR BOILERS and HORIZONTAL WATER TUBE BOILERS for high pressures and ratings; STORAGE and PRESSURE TANKS; TOWERS and TANKS; STRUCTURAL STEEL WORK.

Also Inclined and Cross Drum Water Tube Boilers; Internal Furnace Boilers; Locomotive Type Portable Boilers; Vertical Tubular Boilers; Steel Boiler Casings; Smokestacks; Sugar Crystallizers; Sugar House Tanks.

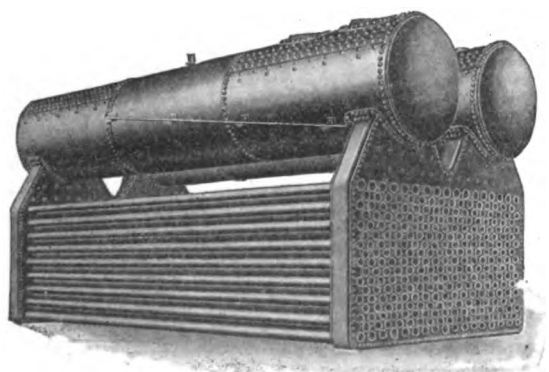
Boilers

Walsh & Weidner boilers are built in one of the largest and most modern plants, by the best of skilled labor, under the personal supervision of the Hartford Steam Boiler Inspection & Insurance Company, inspectors. Also to A.S.M.E. Boiler Code requirements and state codes. Boilers are built for any requirement and for burning any kind of fuel.



HORIZONTAL RETURN TUBULAR BOILERS IN DROP COMBUSTION CHAMBER STEEL CASING SETTING

This company is one of the largest manufacturers of horizontal return tubular boilers in the entire country



HORIZONTAL WATER TUBE BOILER



Horizontal Return Tubular Boilers—

THE WALSH & WEIDNER BOILER CO. makes a specialty of high grade horizontal return tubular boilers and usually furnishes the improved drop combustion chamber steel

setting with them.

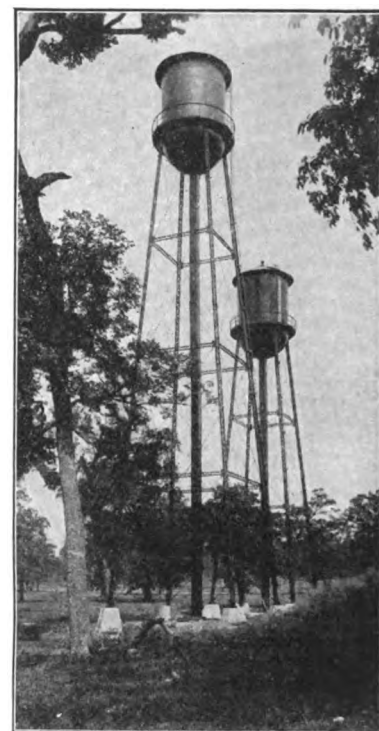
This setting costs about the same as a brick setting and decreases the coal consumption from 10% to 25%. They are built for any number of boilers in a battery and arranged for any special type of furnace.

Tanks and Structural Steel Work

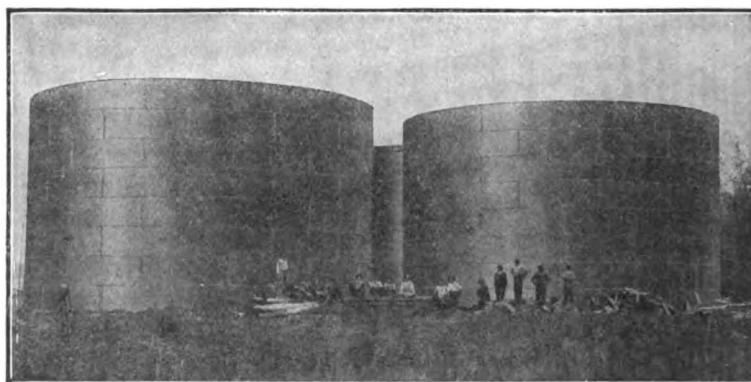
This company is especially well prepared to furnish and erect tanks, plate steel and structural work of any description, and maintains a large, experienced erection force, prepared to erect material of this kind in any part of the country. A large, efficient corps of engineers capable of designing and preparing plans are always at your service.

Catalogues

Send for special return tubular boiler catalogue, also catalogue on tanks.



TOWERS AND TANKS



TWO 1,000,000-GALLON STORAGE TANKS ERECTED FOR THE BARRETT MANUFACTURING CO., FAIRFIELD, ALA.

THE WICKES BOILER CO.

Manufacturers of Water Tube and Return Tubular Boilers

SAGINAW, MICH.

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SEATTLE, WASH., 736 Henry Building

PITTSBURGH, PA., 1218 Empire Building
DETROIT, MICH., 1116 Penobscot Building
CHICAGO, ILL., 76 West Monroe Street

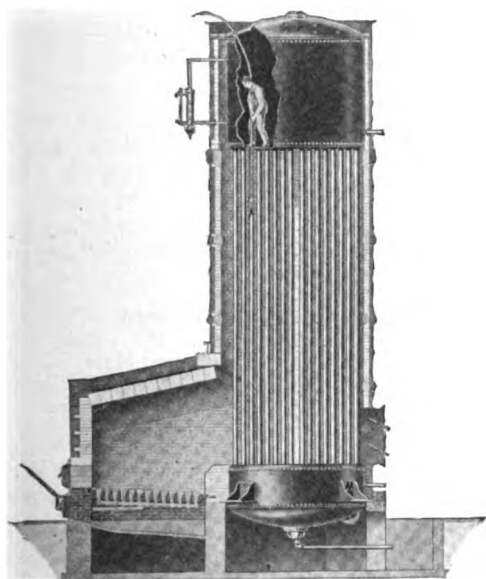
Products

WICKES VERTICAL WATER TUBE BOILERS.
HORIZONTAL RETURN TUBULAR BOILERS.

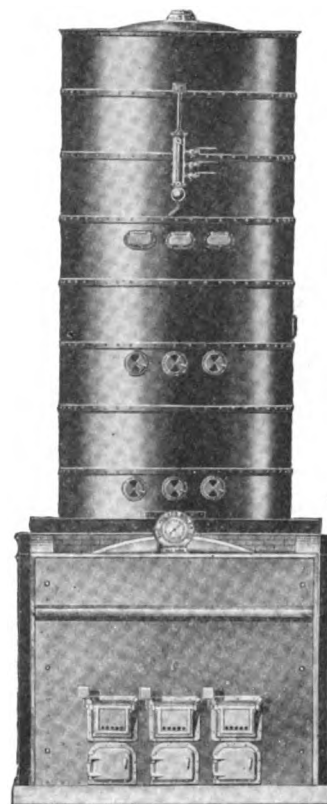
Wickes Vertical Water Tube Boilers

Designed and built in accordance with the Boiler Code of the A. S. M. E.

Two men can open, wash, close and fill the Wickes in five hours. Turbine in ten hours.



WICKES VERTICAL WATER TUBE BOILER
Man stands erect cleaning



STEEL CASED SETTING
Stops air leaks and saves coal

Our practical, educational bulletins, pointing out the way to greater economies in boiler room practice, are yours for the asking. Send for them. They are:

Bulletin 2—"The Steam Boiler Analyst."

Bulletin 3—"Reducing Costs in the Boiler Room"

Bulletin 4—"The Magnitude and Prevention of Air Infiltration Losses."

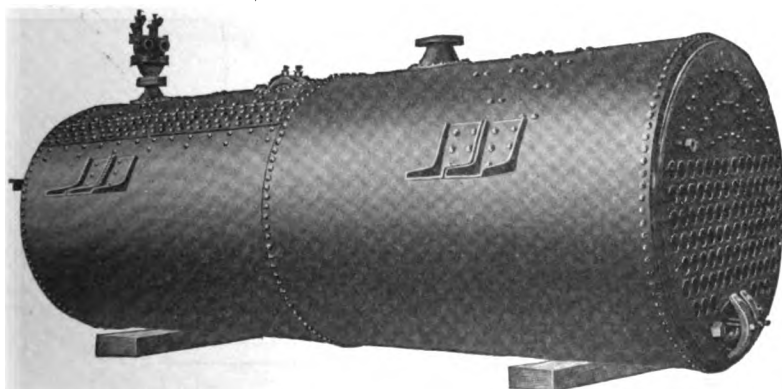
Bulletin 5—"Saving Coal in Steam Power Plants."

Bulletin 6—"The Utilization of Waste Heat for Steam Generation."

Horizontal Return Tubular Boilers

A. S. M. E. Code return tubular boilers. Designed and built by THE WICKES BOILER Co.

Ask for Bulletin—"The Truth About Horizontal Return Tubular Boilers"—covering design and workmanship.



HORIZONTAL RETURN TUBULAR BOILER

BERNITZ FURNACE APPLIANCE CO.

Clinker-proof Furnace Walls

177 State Street
BOSTON, MASS.

BRANCH OFFICES

NEW YORK, N. Y.
CHICAGO, ILL.

ATLANTA, GA.
DETROIT, MICH.

PITTSBURGH, PA.
PHILADELPHIA, PA.

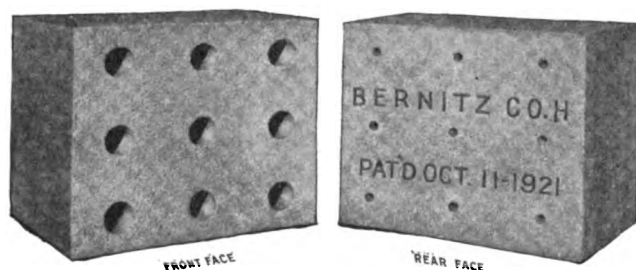
CLEVELAND, OHIO
ST. LOUIS, MO.

Products

BERNITZ CO. CLINKER-PROOF
BLOCKS, BRICKS, and SPECIAL TILES.

Construction

The Bernitz construction (Patented October 11, 1921) consists of ventilated furnace walls at the fuel



BERNITZ CO. CLINKER-PROOF BLOCK, SHAPE "H"
9 x 7 7/8 in. x 7 in. deep

zone. Perforated blocks, made of high grade refractory clay, take the place of the usual fire brick where they contact with the fuel bed. Air (under the same pressure as used in the tuyeres) is sent through the outwardly flared conical apertures in the block, thereby decreasing its velocity, expanding it within the blocks, and holding it to the fire face of the linings.

This expansion of air within the block and curtain of air flushing fire face make the furnace linings *heat resistant* and consequently clinker-proof.

Durability

In boiler furnaces where linings formerly lasted from thirty to sixty days, Bernitz linings have been in service over three years and are still good.

Adaptability

The Bernitz construction is adapted for use in boiler furnaces, gas producers, etc., where the formation of clinkers on the fire walls interferes with efficient and continuous operation. The construction can be as readily installed in old furnaces as new.

Reasons for Using the Bernitz Clinker-proof Construction

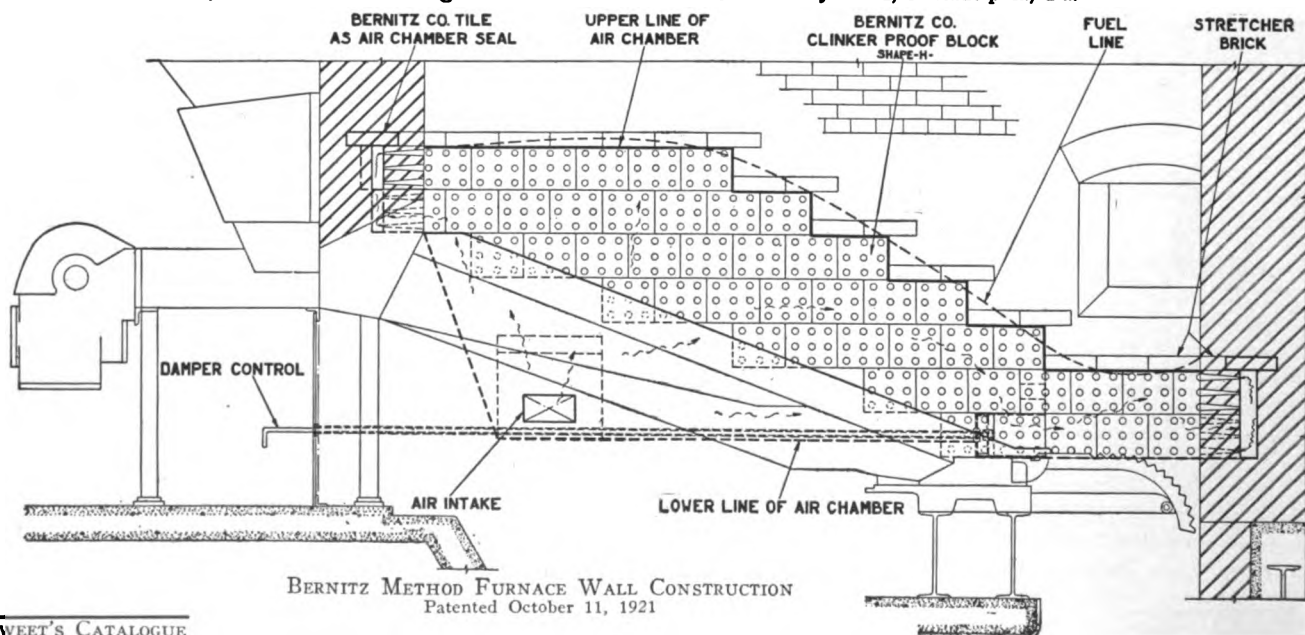
- (1) Allows high furnace temperatures.
- (2) Increases furnace capacity.
- (3) Aids combustion.
- (4) Greatly increases life of furnace walls and settings.
- (5) Eliminates stoker breakage caused by clinkers.
- (6) No shutdowns caused by clinkers on fire walls.
- (7) Saves fuel.
- (8) Conserves labor.
- (9) More contented operators.
- (10) Highest efficiency at lowest maintenance costs.

Literature

Descriptive catalogue and complete information gladly furnished on request.

Partial List of Representative Users

Arlington Mills, Lawrence, Mass.
Boston Elevated Railway Co., Boston, Mass.
Crane Co., Bridgeport, Conn.
Edison Electric Illuminating Co., Boston, Mass.
General Electric Co., Pittsfield, Mass.
Great Northern Paper Co., Millinocket, Me.
Monongahela Power & Railway Co., Fairmont, W. Va.
Philadelphia Electric Co., Philadelphia, Pa.
Solvay Process Co., Syracuse, N. Y.
United Electric Light Co., Springfield, Mass.
United Shoe Machinery Corp., Beverly, Mass.
U. S. Navy Yard, Philadelphia, Pa.



BETSON PLASTIC FIRE BRICK CO., INC.

P. O. Box 386-13

ROME, N. Y.

Products

BETSON'S PLASTIC FIRE BRICK and
BETSON'S HI-HEAT CEMENT.

Uses of Plastic Fire Brick

Betson's Plastic Fire Brick is the pioneer and ideal one-piece furnace lining. It is used in place of bricks, moulded blocks or special tiles in any make and style of boiler, old or new, for lining the furnace, making the front arch and wall, side walls, bridge wall, combustion chamber, back arch and baffles.

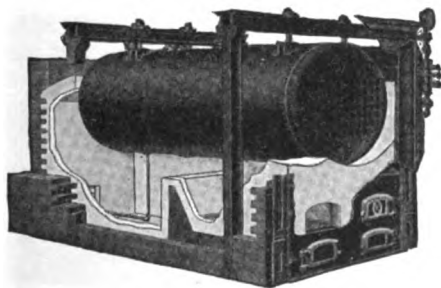
Betson's Plastic Fire Brick is made of the highest grade refractories, properly proportioned to take up the strains of expansion and contraction, due to varying temperatures. It is shipped in 500-lb. barrels, in a moist condition, ready for use.

Furnace Linings—Permanent, gastight furnace linings for water tube and return tubular boilers are easily made right in place, by any one. No special moulds, forms or tools required.

Betson's Plastic Fire Brick is first placed in chunks or balls. Next it is pounded in with a mallet. Then it is smoothed off with a trowel—and the job is done. The result is a one-piece furnace lining that has no joints, is airtight and gastight and lasts for years.



APPLYING BETSON'S PLASTIC FIRE
BRICK FURNACE LINING
Made in one piece and of any desired thickness. Job can be done by any one in old or new boilers



BETSON'S PLASTIC FIRE BRICK AS USED FOR LINING FURNACE
OF RETURN TUBULAR BOILER

Side Walls—Betson's Plastic Fire Brick makes the most serviceable side walls in any boiler furnace. With ordinary fire brick or blocks, the extreme furnace temperatures make the mortar crumble, the joints loosen, and then the bricks finally fall out. With Betson's Plastic Fire Brick the construction is in one piece, without joints, so there is nothing to give way.

Front Walls—Door openings, bridge walls, and other boiler furnace parts can be easily and quickly



formed. These are made in one solid block, from the dead plate to a perfect fit around the boiler shell on fire tube boilers or up to the tube header on water tube boilers, and bonded in as a solid monolithic part of the side walls. Compared with ordinary construction the number of repairs or renewals can be reduced at least three to one.

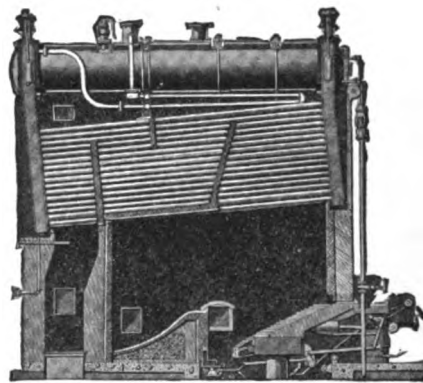
Gastight Boiler Baffles

Gastight baffles, of the right shape and slope, are essential to the efficient operation of water tube boilers. Baffles made of special blocks or tiles are difficult to slope and shape, and because of the joints, they can not be made gastight.

Baffles made of Betson's Plastic Fire Brick (patented) are formed in one piece, without joints. Special tools are not required and the tubes do not have to be pried apart. The baffles can be made horizontal, vertical, or inclined to give the desired tapering gas passages so necessary for uniform velocity and high boiler efficiency.



How A BETSON
VERTICAL BAFFLE
IS FORMED



GASTIGHT BAFFLES OF BETSON PLASTIC FIRE BRICK
Easily formed to give the tapering gas passages necessary in modern high power boilers

Betson's Hi-Heat Cement

For laying up fire brick and tile in settings, furnaces and retorts, Betson's No. 3 Hi-Heat Cement will give the best service. Fire Brick usually begins to soften at 3000°, but Hi-Heat Cement withstands temperatures of 3100° and over. It will therefore maintain a perfect bond as long as the brick or tile lasts. The material is shipped in 400-lb. barrels and is ready for use by the addition of water.



Catalogues

Specialized booklets dealing with the applications of Betson's Plastic Fire Brick, Boiler Baffles and Hi-Heat Cement are available. These practical and instructive catalogues are gladly sent on request.

CELITE PRODUCTS COMPANY

Producers of Insulating Material and Cements

11 Broadway
NEW YORK, N. Y.

SALES OFFICES

PHILADELPHIA, PA., Bulletin Building
PITTSBURGH, PA., Oliver Building
CLEVELAND, OHIO, Bulkley Building
MINNEAPOLIS, MINN., 251 Sixth Avenue, South

CHICAGO, ILL., Monadnock Building
DETROIT, MICH., Book Building
ST. LOUIS, MO., Railway Exchange Building
NEW ORLEANS, LA., Whitney Central Bank Building

SAN FRANCISCO, CAL., Monadnock Building
LOS ANGELES, CAL., Van Nuys Building
DENVER, COLO., Symes Building

Products

SIL-O-CEL NATURAL INSULATING BRICK, BLOCKS, POWDER AND CEMENTS for Heated Equipment, for Cold Storage Insulation, and also for Sound Deadening and Fireproofing in Building Construction.

CELITE HIGH TEMPERATURE CEMENTS for Laying, Facing and Patching Fire Brick Settings.

CELCOTE for Preventing Infiltration of Air in Brick Settings in Heated Equipment, also as a Waterproofing Coat for Sil-O-Cel Insulation.

Also manufacturers of Filter-Cel, an Inert Mineral Powder, used in conjunction with filtering equipment presses to improve the clarity of filtered liquids.

Sil-O-Cel

Sil-O-Cel is a light weight, highly siliceous insulating material which withstands a direct heat of 1600° Fahr., and has a melting point of 2930° Fahr.

Sil-O-Cel Natural Insulating Brick—Made in standard fire brick sizes and shapes. Used as an insulating backing for fire brick linings, and on steel surfaces where a high temperature insulation is required.

Sil-O-Cel Insulating Powder—This form has the same insulating qualities as Sil-O-Cel Brick but is used in work where bricks are not adaptable, such as hollow wall spaces or between the fire brick and shell of incased equipment. It is also used for fireproofing and sound deadening. When packed in place Sil-O-Cel Insulating Powder weighs 15 lbs. per cu. ft.

Sil-O-Cel C-22 Brick—A semirefractory type of Sil-O-Cel Brick also made in standard fire brick sizes and shapes. These bricks are free from shrinkage at high temperature and will not spall with sudden temperature changes. Recommended as an intermediate insulating course under extreme temperature conditions.

Sil-O-Cel C-3—A semirefractory material in granular form. It may be suitably bonded by the addi-



tion of 20% by volume of portland cement. When moistened slightly and rammed into place, this material provides an excellent means of insulating furnace doors, bases, and other places requiring a semirefractory insulating material.

Sil-O-Cel Blocks—A bonded form of Sil-O-Cel furnished in sizes 6x18 in. and 6x36 in., in thicknesses of 1, 1½, 2 and 3

in. Suitable for insulating units requiring insulation in large sections, such as tanks, stills, evaporators, breechings, etc.

Sil-O-Cel Insulating Cements—Prepared in three types as follows:

Sil-O-Cel Sticking Cement (first coat).

85% Sil-O-Cel Insulating Cement (second coat).

Has unusually high insulating value and durability under heat.

Sil-O-Cel Hard Finish Cement (third coat).

Celite High Temperature Cements

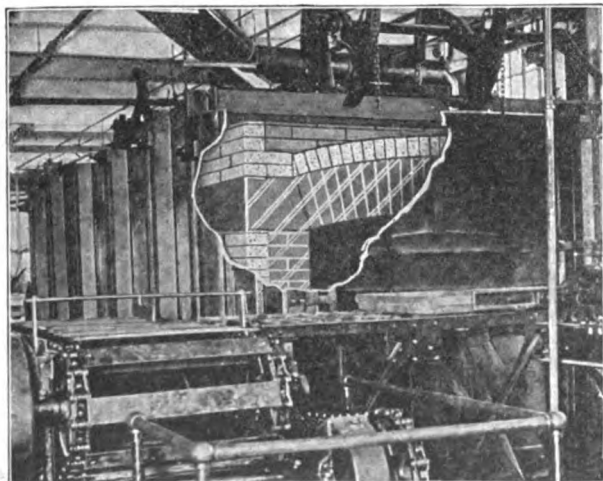
Made in several grades for temperatures ranging from 1800° to 3200° Fahr. Used for laying, facing and patching fire brick. They preserve the refractory lining, prevent spalling and cracking, and prevent air infiltration.

Celcote

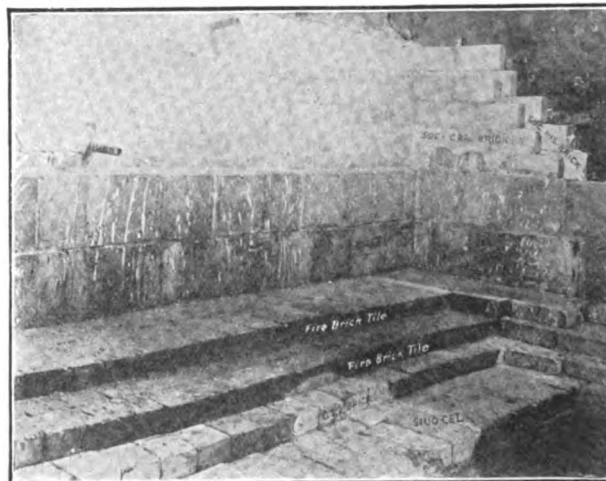
An elastic and bitumastic compound for preventing infiltration of air through brick construction; also for waterproofing Sil-O-Cel insulation exposed to the weather or subject to dampness. Applied in one or two coats; each ⅛ in. in thickness.

Service

The services of our technical staff are at the disposal of any one desiring help or information on heat insulation problems. This service is gladly rendered and incurs no obligation. Address nearest office.



TYPICAL CROSS SECTION OF SIL-O-CEL INSULATION CONSTRUCTION



INSULATION CONSTRUCTION OF OIL FIRED BOILER, INSULATED WITH SIL-O-CEL C-22 BRICK AND SIL-O-CEL INSULATING BRICK

DRAKE NON-CLINKERING FURNACE BLOCK CO., INC.

5 Beekman Street
NEW YORK, N. Y.

ATLANTA, GA.
BOSTON, MASS.
CHICAGO, ILL.
CLEVELAND, OHIO

BRANCH OFFICES
DETROIT, MICH.
GRAND RAPIDS, MICH.
MILWAUKEE, WIS.
NEW ORLEANS, LA.

PHILADELPHIA, PA.
PITTSBURGH, PA.
TOLEDO, OHIO
MONTREAL, CANADA

Product

DRAKE NON-CLINKERING FURNACE BLOCKS.

Drake Non-Clinkering Furnace Blocks

These are specially designed blocks having tapered perforations and lugs on back which form an air duct within the furnace lining.

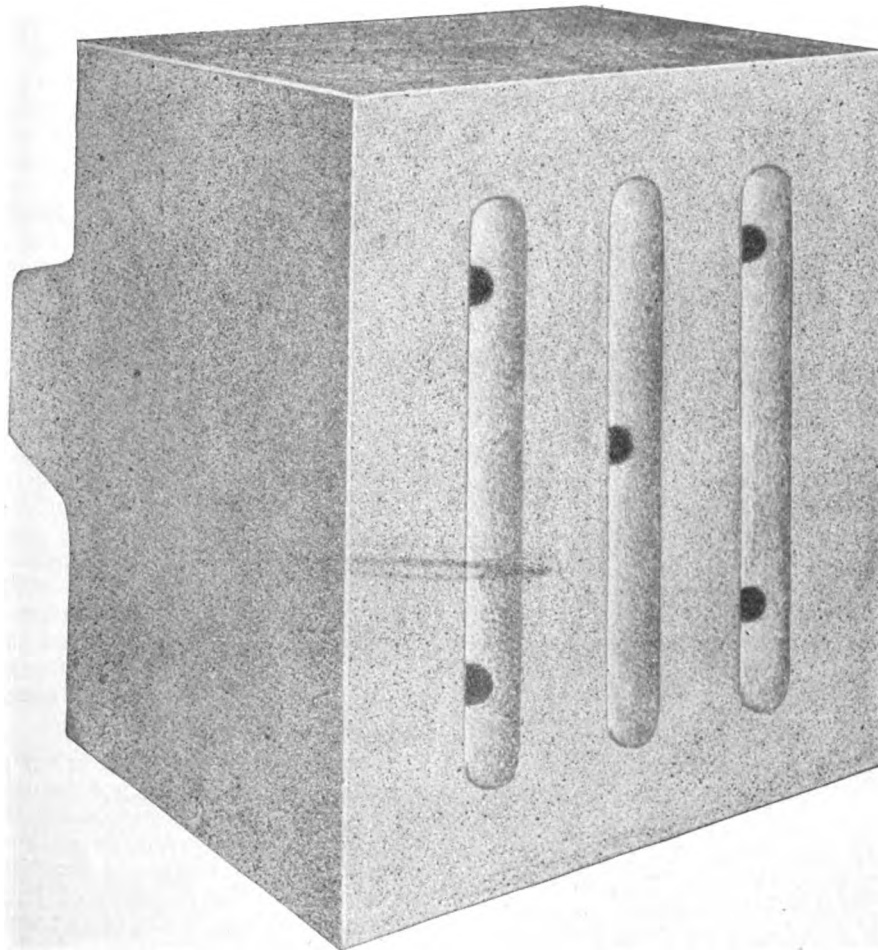
Air admitted through the perforations keeps the temperature of the surface exposed to the fire below the fusing point and enables the blocks to resist the corrosive action of combustion gases. This effectively prevents

clinker formation, reduces brickwork maintenance and increases over-all furnace economy.

Drake blocks are manufactured and licensed under the Drake and Bernitz patents, thus affording double protection for our customers.

Blocks are made from a specially ground refractory material and properly burned to take care of expansion and contraction and to insure a smooth, hard surface on furnace face.

Write to our nearest office for further details.



DRAKE NON-CLINKERING FURNACE BLOCK
Note fluted face. This prevents holes from plugging and makes 20% of area of face of block effective as cooling surface

ESTABLISHED 1844

LACLEDE-CHRISTY

Manufacturers of Refractories, Automatic Stokers, Furnace Arches

ST. LOUIS, MO.

BRANCH OFFICES

NEW YORK, N. Y., 50 East 42nd Street
PITTSBURGH, PA., 901 Oliver BuildingDETROIT, MICH., 835 Book Building
CHICAGO, ILL., 1366 Peoples Gas Building**Products**

LACLEDE-CHRISTY FIRE CLAY REFRACTORIES for Industrial, Chemical, Metallurgical and Power Plant Purposes; FIRE BRICK and SUPRAFRAX BRICK in Standard and Special Shapes.

LACLEDE-CHRISTY CHAIN GRATE STOKERS; STOWE STOKER; LACLEDE-CHRISTY FLAT ARCHES and FLAT ARCH TILE.

ARCHNU, a repair cement.

Also manufacturers of Vitrified Products, including: Sewer Pipe, Segment Blocks, Wall Coping, Hollow Tile, Flue Linings, etc.; High Pressure Water Backs.



FIRE BRICK

no laminations, expansion and contraction at working temperatures practically nil. This quality prevents spalling or cracking, which recommends its use under sudden changes of temperature.

Government tests give cone 32 plus as the fusion point, which is about 3218° Fahr.

Laclede-Crown Brick—A stiff mud process brick. Resists abrasion, destructive slagging action, and has great load-bearing strength at high temperatures.

Government tests give cone 32 plus as the fusion point, which is about 3218° Fahr.

Laclede-St. Louis Brick—Made by the dry press process. A most reliable brick for general furnace work. Of even texture, free from laminations, and its expansion and contraction at working temperatures is very low. It resists sudden changes of temperature well, and does not spall.

Laclede-Christy-St. Louis Brick—A stiff mud process brick. No. 1 grade. Designed to resist abrasion and clinker action. For service where the fire brick are subjected to mechanical wear, this brand is particularly well adapted, due to its hard, dense nature.

Government tests give the fusion point as cone 29 plus, which is about 3100° Fahr.

Recent tests show the following compressions and contractions for "Laclede-St. Louis" and "Laclede-Christy-St. Louis" Fire Brick:

	Laclede-St. Louis Brick	Laclede-Christy-St. Louis Brick
Compression in 1350° C. load test of 25 lbs. per sq. in.	5.3%	3.1%
Contraction after 5 hours at 1400° C .....	.36%	.22%
Fusion-cone	30 1/2	30 3/4

Laclede-Special-Crown-Brick—A hand-made brick of extra high quality. Very refractory, because of the unusually high proportion of flint clay. Its low initial porosity makes it resistant to slags and molten metal. Government tests give cone 33 1/2 as the fusion point which is about 3272° Fahr.

Suprafrax Brick—A hand-made, super-refractory, without an equal in the fire brick field. Alumina content of over 76%, which tends to class it as a basic refractory; the Ceramists, however, define it as *neutral* in action.

Suprafrax has great strength and it is the most



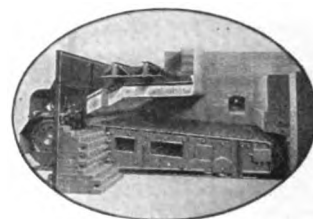
TRADE-MARK

refractory brick of the Laclede-Christy line. In government tests the temperature of 3300° Fahr. was reached without fusing this brick, and from tests made in our own and other laboratories the temperature of 3400° Fahr. was shown to be *below* the fusion point.

Laclede-Christy Chain Grate Stoker

This is a natural-draft stoker, for high volatile coals, representing the highest development of its type.

It is of the self-cleaning link pattern, of high quality construction, and is installed with such capable engineering that the furnace, stoker and draft facilities as a coal-burning unit leaves nothing to be desired in economy, capacity, flexibility, or labor expense.



CHAIN GRATE STOKER

Stowe Stoker

This is a forced-draft type, whose fundamental principle is conveyor feed, positive in action from coal hopper to ash pit. These are a few compelling features:

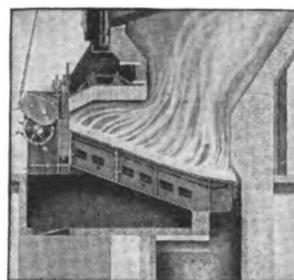
(1) A single Stowe Stoker can be used for units up to 1500 h.p., thus doing away with the center furnace wall.

(2) The tuyeres are provided with graduated air spaces arranged to proportion the air correctly to the gradually varying requirements of the burning fuel bed. The design of the tuyeres is such that drippage is reduced to a negligible minimum.

(3) It is the only conveyor feed built on a divided incline and therefore excels in strong ignition temperatures.

(4) It is the only conveyor feed that holds the nearly spent fuel back on the grate until every bit of combustible is consumed.

(5) It does not form clinkers, and it positively and automatically discharges the ash from the furnace.



STOWE STOKER

Laclede-Christy Flat Arches

Can be successfully used in any place where a crown or top is required for a hot furnace.

The design of the supporting structure of the arch is based on the multipiece or sectional idea, which contributes to the strength and flexibility of the arch and makes possible the adoption of long arches.

We manufacture the tile as well as the iron work. We also carry in stock shapes of all other brands of tile. L-C flat arch tile are made of absolutely dependable and always uniform materials.

Archnu

A refractory cement in dry form for repairing spalled or cracked furnace arches of every type. Also suited for patching furnace walls, ledge tile, etc.

QUIGLEY FURNACE SPECIALTIES, INC.

26 Cortlandt Street
NEW YORK, N. Y.

SALES OFFICES

CHICAGO, ILL.

PHILADELPHIA, PA.

PITTSBURGH, PA.

PROVIDENCE, R. I.

REPRESENTATIVES IN 56 CITIES IN THE UNITED STATES AND CANADA

Products

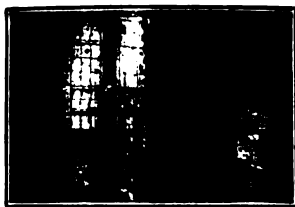
HYTEMPITE, a Dense, Plastic, Refractory Material, scientifically compounded for bonding fire brick and kindred uses.

CARBOSAND, a highly Refractory, Granular Material for making rammed-in linings, special tile, patches and repairs in furnace structures.

HIGH TEMPERATURE INSULATION, made in Brick, Block, Powder and Cement Form for retarding heat flow through boiler and furnace walls, stills, ovens and similar equipment.

Hytempite

A high temperature furnace cement mortar which forms a lasting union between materials to be joined. It sets at normal temperatures and retains its strength up to temperatures at which the best quality of brick loses strength and becomes soft.



LAYING BOILER SETTINGS
WITH HYTEMPITE



PATCHING RETORTS WITH
HYTEMPITE

Hytempite, when used in place of fire clay for laying up brickwork, greatly adds to the life of the structure. It is used for furnace and boiler settings and repairs; for setting tile, retorts, oil stills; lining metal melting furnaces, pit furnaces, foundry cupolas and ladles for patching hot furnaces, and as a core wash.

Tests have proved that Hytempite used as a binder, when air set, forms a joint as strong as the refractory material united and that the strength is not impaired but increased by the action of heat.



REPAIRING FURNACE DOORS
WITH HYTEMPITE

Carbosand

Carbosand is a highly refractory fire sand made in the electric furnace by fusing at high temperature, a mixture of silica and petroleum coke.

Carbosand is uniform in grade and analysis. It is a blend of fine and coarse particles properly proportioned to form the correct aggregate for furnace lining, special shapes and tile, and for patching work in furnaces, boiler settings, etc., using Hytempite as a binder. Carbosand is shipped in 125-lb bags.



REPAIRING BOILER FURNACES
WITH HYTEMPITE AND CARBOSAND

High Temperature Insulation

These products possess exceptional heat insulating qualities and are specially adapted for heat conservation at high temperatures:

Standard Insulbrix—9x4 1/2 x 2 1/2 in.; weight approximately 2 2/3 lbs. or about one-third the weight of ordinary fire brick. The conductivity of Insulbrix is extremely low—1 in. of Insulbrix is equal in insulating value to six to ten times the same thickness of fire brick or red brick, depending on conditions such as furnace temperature, conductivity of other brick, etc. They have high heat resisting qualities, their fusing point being over 2900°, without shrinkage at 1750° Fahr. (Even as high as 2000° Fahr. the shrinkage is extremely small.) Crushing strength over 500 lbs. per sq. in. Used as an insulating course in boiling settings, furnaces, kilns, ovens or other structures where the conservation of heat and uniform temperature are desired.



STANDARD SIZE INSULBRIX

Insulbond—A cement especially prepared for laying Insulbrix without wetting them; effectively bonds the brick without lessening their insulating value. Shipped dry in bags, and used in the form of a thin batter. Special instructions as to the use of Insulbond accompany each shipment. Quantity required, 200 lbs. to 1000 Insulbrix.

Insuline (Calcined)—In crushed and ground form is used as a filler within walls of furnaces or oven structures where high temperatures are met. It is the base material from which other high heat Insuline products are made.

Insulcrete—Crushed Insulbrix (calcined) bonded by the addition of one-sixth by volume of portland cement. Makes an excellent light weight refractory insulating lining for doors, also for foundations and bases of furnace structures and in such places where a light insulatory refractory material of high strength is required.

Insulcoat—A plastic mixture composed principally of ground Insuline. Used for coating furnace walls, boiler drums and other heated equipment. It is trowelled on to any desired thickness, using metal reinforcement when necessary. It effectively retards heat flow and is used where standard and special shapes or blocks of Insulbrix can not be applied.

Brixcoat—A special surface coating for Insulbrix to give them a hard finish when used as an outside course in furnaces or other structures. It is applied with a brush like paint or varnish, and is waterproof, heatproof and resists abrasion.



LAYING INSULBRIX AS
OUTSIDE COURSE

STEAM BOILER EQUIPMENT CO.

Furnace Lining Materials

Monadnock Building
CHICAGO, ILL.

REPRESENTATIVES IN ALL OF THE PRINCIPAL MANUFACTURING CENTERS

Products

REFRACTO-PUTTY, a plastic furnace lining material.
MIXIT, Refracto-Putty in dry form.
REFRACTO-COAT, a fire resisting paint.
REFRACTO-BOND, a fire brick bonding material.

Refracto-Putty

What It Is—Refracto-Putty is made from the same refractory materials used in manufacture of high grade fire brick; it is practically fire brick in putty form. It is guaranteed to withstand 3300° Fahr.

Uses—Refracto-Putty has been used extensively (see list of references below) for patching worn furnace linings, and for building jointless, one-piece boiler door arches, sidewalls, bridge walls, rear arches of fire tube boilers, baffles in water tube boilers, curved stoker arches, dutch ovens and complete furnace linings of every description.

Advantages—Refracto-Putty can be installed more quickly than standard fire brick. It will "stand up" much longer because walls built with Refracto-Putty are solid and all in one piece, instead of being weakened by a multiplicity of joints which are the weak part of any job built with standard fire brick.

Refracto-Putty furnace linings increase furnace efficiency by keeping the cold air out and the hot gases in. When furnace linings are built with standard fire brick, joints between the brick soon open up and permit cold air to enter and lower furnace temperature.

Other advantages are that Refracto-Putty can be installed by unskilled labor, whereas standard fire brick must be installed by experienced fire brick masons. In using Refracto-Putty, any one with ordinary intelligence can pound it in place with a mallet and smooth it off with a trowel.

How Shipped—Refracto-Putty is put up in a stiff, moist, pliable "ready-to-use" form, in barrels weighing 700 lbs., a barrel being equivalent to 100 standard fire bricks.

Testimonials—The following excerpts from letters selected from many received, give some idea of the varied uses Refracto-Putty has been put to and how well it has lived up to the claims made for it.

PRESSED STEEL TANK CO., MILWAUKEE, WIS.—"We have used Refracto-Putty in lining our annealing furnace doors. The amount of heat in this service is 1500° to 2000° and for this purpose it has proved very satisfactory."

NORTHERN WOOD PRODUCTS CO., GLIDDEN, WIS.—"We have used Refracto-Putty for numerous repair jobs and in 1919 we used nearly a carload for constructing the lining of a dutch oven on one of our boilers. Our experience with it has been very satisfactory, much more so than with fire brick."

INDIANAPOLIS WAREHOUSE CO., INDIANAPOLIS, IND.—"We used this product on the front arch of a 100 h.p. boiler and it has proved entirely satisfactory."

CULVER MILITARY ACADEMY, CULVER, IND.—"We used Refracto-Putty to line our forced draft, stoker-fired furnaces last October and they are holding up fine. Our boilers operate all winter at over 200% rating and any refractory material which will hold up under such conditions is a real improvement over the costly fire brick lining system."

Mixit

This product is made from the same high grade refractories as Refracto-Putty but is put up and shipped

in dry form in 100-lb. bags. Six bags of Mixit mixed with 100 lbs. of water will make 700 lbs. of Refracto-Putty.

Advantages—Mixit has many advantages over Refracto-Putty, or any other plastic furnace lining material, because of the fact that it is shipped in dry form. Users of plastic furnace lining material are required to pay for about 100 lbs. of water per barrel besides having to pay freight thereon. Users of Mixit are not required to pay for water, nor are they required to pay freight on water.

Other advantages are that it does not freeze when stored in a cold place, nor dry out if stored in a warm place. Mixit comes ready to use upon being mixed with the proper amount of water. It is easier to add a certain amount of water to each 100-lb. bag of Mixit than it is to add water by guesswork to a barrel of plastic furnace lining material that has partly dried out.

Refracto-Coat

What It Is—Refracto-Coat is a surfacing material of the consistency of heavy paint, two coats of which will preserve fire brick or any kind of refractory blocks against extremely high temperatures, the erosive action of either flame or molten metal and against the chemical action of fuel. Furthermore, clinkers will not stick tight to furnace linings coated with Refracto-Coat.

Uses—For surfacing the linings of boiler furnaces, industrial furnaces, foundry cupolas, foundry ladles, gas generators, etc.

How Applied—Refracto-Coat should be applied with a brush the same as paint. Two coats should be applied about two or three hours apart.

How Shipped—Refracto-Coat is put up and shipped in 5-gal. cans. A 5-gal. can is sufficient for coating 500 sq. ft. of surface with two coats.

Refracto-Bond

A superior bonding material for laying up fire brick. Fire brick bonded together with Refracto-Bond can not be pulled or broken apart, nor can they be burned apart. Refracto-Bond should not be confused with any of the so-called high-heat resisting cements whose fusion points are around 3000° Fahr. The base of Refracto-Bond is silicon carbide, the fusion point of which is about 6000° Fahr. When furnace linings are built with standard fire brick, the fire brick should be dipped and laid up in Refracto-Bond (the same as would be done when using a thin fire clay mixture). Then the surface of the finished lining should be coated with two coats of Refracto-Coat.

Literature

Pamphlets descriptive of these products and showing their application mailed on request.



WALSH FIRE CLAY PRODUCTS COMPANY

Manufacturers of Fire Brick and Refractory Material

4070 North Main Street

ST. LOUIS, MO.

BRANCH OFFICES

CHICAGO, ILL., 7 West Madison Street

NEW YORK, N. Y., 220 Fifth Avenue

Products

The WALSH BRAND of STANDARD FIRE BRICK and SPECIAL SHAPES used in Linings for Blast Furnaces, Stoves, Cupolas, Brass Furnaces, and for the construction of all kinds of Iron and Steel Furnaces, Malleable Iron Air Furnaces, Heating Furnaces, Copper Smelting and Copper Refining Furnaces; also in the construction of Smelting Furnaces, tin, zinc, lead, silver, and gold, Linings of Cement Rotaries, Boiler Furnaces and special material for the modern powerhouse and high powered stokers, including all special work for drawing.

Also Standard Brick, Glass Tank Flux and Refractory Blocks and Specials used in the construction of Glass Furnaces, Lehrs, Annealing Ovens, etc.

Service

The Walsh brands of fire brick have been on the market many years, an old tried out line of furnace material. The output is large, therefore this company is in shape to take care of large orders quickly and always glad to receive small favors. The greater part of this business is repeat orders, showing the popularity of these brands of fire brick. They are manufactured for quality and are considered among the best produced.

In the early part of 1919 this company brought into operation its third fire brick plant, it being one of the largest and most modern in the country. Every consideration was given to latest devices and machinery for the work intended, and it has, after a year's service, met all demands.

The engineering department of this company is composed of men competent in their line and will be found an aid whenever needed in problems of construction, furnishing plans and specifications when necessary.

This organization, in all departments, is composed of experts, qualified with years of experience in the manufacture, sale, and use of fire brick.

Much progress has been made in the glass product line, the material being of the highest quality and is received with much favor by glass manufacturers.

Clays

This company produces all its own clays and selects the various kinds and grades for the work intended.

Walsh XX Brand

A brand of brick in the standard 9 in. and 9 in. series, also in special shapes.

It is of an open, porous structure, manufactured from selected Missouri flint clays, made to resist high heats and sudden changes in temperature.

It is a brick of quality and very popular where much is expected and where furnace temperatures are high.

Walsh Brand

A brand of brick, made in the standard 9 in. and 9 in. series, also special shapes.

It is made in two kinds. First, a tough, dense material, of selected high grade clay, made to resist high heats and abrasion. Second, brick made semiopen, of the same clays as above, to resist high heats and quick changes.

Both of these brick have many uses, the dense brick is popular where there are fluxes such as in lead, tin and other smelting operations.

Full information concerning these splendid brick gladly furnished on request.

Information

This company solicits inquiries. Information will be cheerfully given concerning the various kinds of material required in furnace construction.

Shipping Facilities

Being conveniently located on the various railroads, with direct connections, prompt shipments may be expected.

Export Trade

The large stocks carried at the various plants enable this company to make prompt shipments. The export trade is increasing very fast, indicating that the high quality of these brands of fire brick are being appreciated and repeat orders are the result.

BROOKLYN FIRE BRICK WORKS

Manufacturers of High Grade Refractories

91 Van Dyke Street
BROOKLYN, N. Y.

Products

FIRE BRICK, SUSPENDED FURNACE ARCHES, BACK CONNECTION ARCHES, INTERLOCKING BRICK ARCHES, BLOW-OFF PROTECTORS, SPECIAL SHAPES, FIRESEAL HIGH TEMPERATURE CEMENT.

Brooklyn Fire Brick

Our brick are made from the highest grades of New Jersey clay. They are very dense and close textured and are impenetrable at high temperatures. They are now being used with entire satisfaction in several types of electric furnaces—the most severe kind of refractory service.

The Diamond SM fire brick is the highest grade clay refractory obtainable. It is entirely immune to the clinkering action of fusing coal and the slagging action of metallic fluxes, and is unaffected by intense oil flames.

For normal duty service where first quality brick are essential, our Brooklyn No. 1 brick will be found to give exceptionally long service.

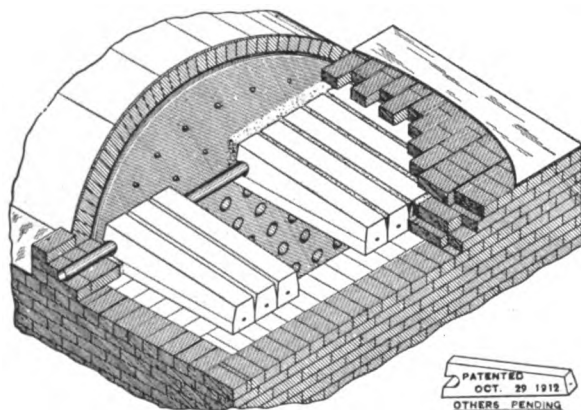
Brooklyn Suspended Furnace Arch (Patented)

This arch is made either flat or curved, for all types of stokers, ovens and furnaces. The blocks are suspended by means of a slot which fits over a rounded hanger. Key blocks placed at intervals permit making repairs from underside of arch. The patented rounded hanger and slot distribute the load properly and eliminate splitting of the blocks.

This arch is very strong and durable, has few parts, and is easily and quickly assembled.

Brooklyn Back Connection Arch (Patented)

This type of arch is suitable for all types and sizes of horizontal tubular boilers. It is very simple, consist-



BROOKLYN BACK CONNECTION ARCH

ing of a piece of 2-in. pipe and a number of interchangeable, high heat resistant, refractory blocks. Blocks are set dry, the expansion joints on the ends and sides being filled with asbestos. This leaves boiler free to expand and contract and there is no thrust on boiler walls. Natural circulation of air through pipe keeps it cool and straight.

This arch prevents exposure of boiler shell above water level. Blocks can be readily removed to provide access to rear of boiler.

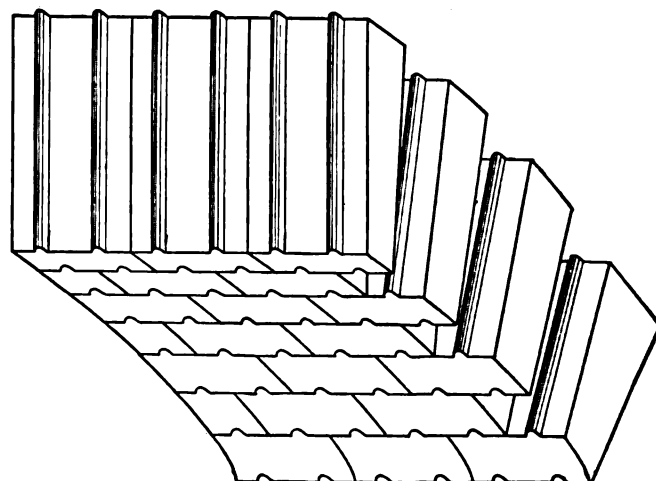
Brooklyn Interlocking Brick Arch (Patented)

Built up of beveled, tongued and grooved, fire brick. Designed to obviate the difficulties often encountered in arches constructed of ordinary bull head or arch fire brick for use in connection with high temperature boilers and furnaces. These ordinary arches frequently collapse under intense heat.

The design of the brick used in the Brooklyn interlocking arch is such that the arch can be built as close to the grate as desired, without danger of collapsing. Bricks interlock and form a solid mass. They can not part—even the half brick at the end remains in place until burned beyond the tongue and groove.

Arches can be built to any desired radius.

Unequalled for stoker arches, Dutch ovens, ignition arches, etc.



BROOKLYN INTERLOCKING BRICK ARCH

Brooklyn Blow-off Protector (Patented)

A series of interchangeable, semicircular blocks that interlock in all directions. For protecting blow-off and other pipes from the heat and gases of the furnace. Can be readily assembled and taken apart. Blocks are made of high heat resistant fire clay.

Special Shapes

This company has for more than sixty years been specializing in the manufacture of difficult shapes, a number of which are carried in stock. These include: Boiler door arches for all types of boilers, sidewall blocks, cleaning table blocks, tube brick for baffle walls, and brass furnace and cupola blocks. Special shapes of any kind can be made to order.

Fireseal High Temperature Fire Cement

Develops a strong bond with brick when heated to 2000° Fahr. Will not run from joints except at temperatures above 3600° Fahr. Will not shrink. Made from substantially the same material as our brick. Can be made to set at low temperatures by mixing with 10% by weight of sodium silicate. Shipped dry.

M. H. DETRICK COMPANY

Manufacturers of Flat Suspended Fire Tile Arches

155 East Superior Street
CHICAGO, ILL.

DISTRICT SALES OFFICES

ATLANTA, GA.
BOSTON, MASS.
CHICAGO, ILL.
CHARLOTTE, N. C.
CINCINNATI, OHIO
CLEVELAND, OHIO

DAYTONA, FLA.
DENVER, COLO.
DETROIT, MICH.
HAZLETON, PA.
HOUSTON, TEX.
KANSAS CITY, MO.

MEMPHIS, TENN.
MILWAUKEE, WIS.
MINNEAPOLIS, MINN.
NEW ORLEANS, LA.
PHILADELPHIA, PA.
PITTSBURGH, PA.

PORTLAND, ORE.
ROCHESTER, N. Y.
SEATTLE, WASH.
SAN FRANCISCO, CAL.
TULSA, OKLA.
SALT LAKE CITY, UTAH

MONTREAL, QUE.

Products

DETRICK ARCHES, adaptable to all types of boilers, stokers, oil stills and all types of furnaces.

For Detrick-Hagan Steam Jet Ash Conveyor, see page 840.

Service

Over 6000 of these arches have been installed under various conditions, and the experience thus gained has enabled the M. H. DETRICK COMPANY to build up an organization consisting of specialists in combustion engineering who are thoroughly versed in all types of furnace work. Each individual installation is a separate engineering problem and is handled as such.

Detrick Arch

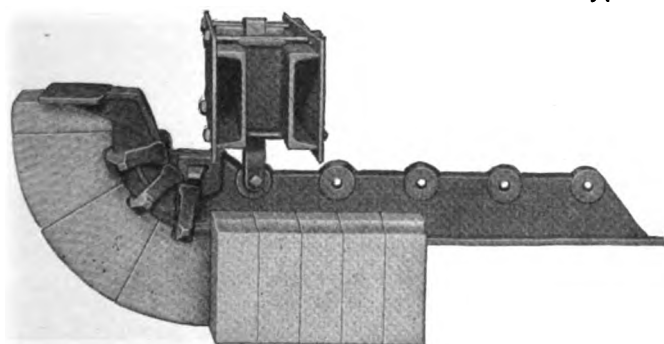
The Detrick arch is the only type of flat arch in which the tile is suspended and not rigidly held. Each tile is individually hung from the center, so that each tile becomes a unit in itself and is allowed to expand and contract freely.

In the construction of the Detrick arch the tile are hung on cast iron bars which in turn are suspended from steel beams. The steel beams span the furnace and rest on the sidewalls. The force due to the weight of the arch is all exerted downward on the sidewalls. There is no outward thrust on the walls.

Provisions are made for the expansion or contraction of the arch. Therefore a Detrick arch will outlast a sprung arch because it is not required to withstand the stresses due to expansion or contraction. Greater furnace efficiency will also be obtained because the flat surface provided distributes the gases more evenly to the boiler or furnace and provides more combustion space.

Type "D" End Construction

The end of the arch is subjected to the most severe service. The illustration below shows the new type of



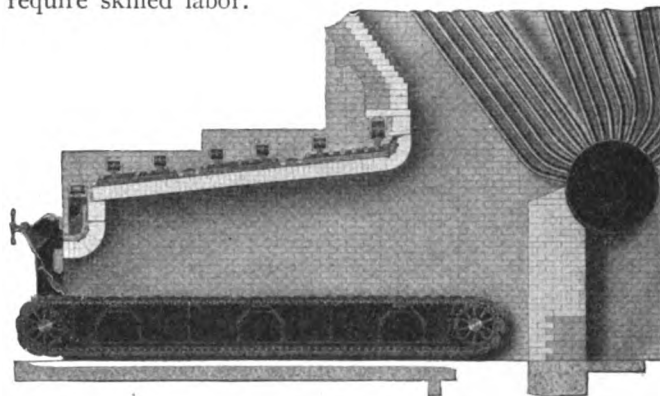
TYPE "D" END CONSTRUCTION FOR DETRICK ARCH

fan end construction, in which only one face of each tile is exposed to the fire, giving more uniform radia-

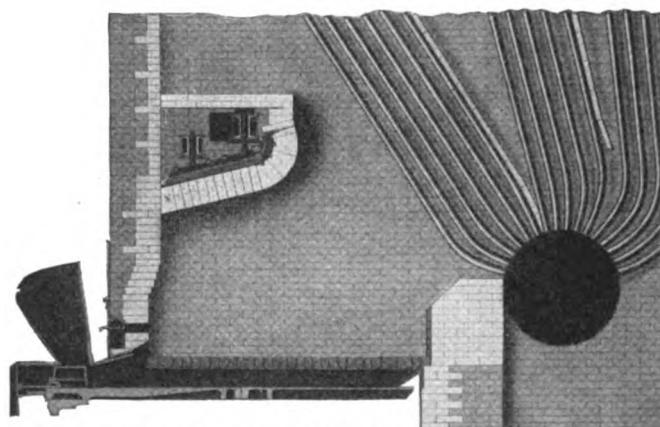
tion and longer tile life. It is easy to repair and provides ample protection to the castings.

Installation and Repairs

In the erection of the Detrick arch no skilled labor is required. It is only necessary to string the tile on the cast iron beams. When repairs are necessary it can be repaired in sections, without disturbing the balance of the construction. This work does not require skilled labor.



TYPICAL INSTALLATION OF DETRICK ARCH OVER FORCED DRAFT CHAIN GRATE STOKER



SHOWING DETRICK ARCH INSTALLED OVER AN UNDERFEED STOKER

Users

Boilers representing a total of 1,500,000 b.h.p. are successfully equipped with Detrick arches.

A few of the prominent users are:

American Rolling Mill Co., Middletown, Ohio
American Gas & Electric Co., New York, N. Y.
Atlantic Refining Co., Philadelphia, Pa.
Baltimore & Ohio R. R. Co., Baltimore, Md.
Carnegie Steel Co., Pittsburgh, Pa.
Delaware, Lackawanna & Western R. R. Co., Scranton, Pa.
New York & Pennsylvania Co., Lock Haven, Pa.
Texas Company, Houston, Tex.
St. Paul & Tacoma Lumber Co., Tacoma, Wash.

McLEOD & HENRY CO.

Manufacturers of Forms for Boiler Settings

TROY, N. Y.

BRANCH OFFICES

NEW YORK, N. Y., 1400 Broadway

DETROIT, MICH., 300 Moffatt Building

BOSTON, MASS., 533 Little Building

Products

"STEEL MIXTURE" BOILER SETTINGS, consisting of Boiler Door Arches, Firebox Linings, Back Combustion Chamber Arches, Blow-off Pipe Protectors, Inner and Dutch Oven Arches, Fire Brick of all kinds, Fire Clay and Fire Cement.

"Steel Mixture"

"Steel Mixture" is a hard and refractory substance especially produced for boiler setting use and is noted for its ability to give long service under modern furnace conditions.

It is shipped on receipt of order, fitted to your exact requirements. Special shapes made to order.

Fire Cement

"Steel Mixture" fire cement is a high temperature bonding material (powdered form) for laying up fire brick, patching and miscellaneous furnace repairs.

Boiler Door Arches

The boiler door arches are of standard form and made in suitable sizes, so that practically any size or shape can be supplied. The arches flare up and to the sides so as not to obstruct the spreading of the fuel. Not being bonded to the brickwork above, any disturb-



"STEEL MIXTURE" BOILER DOOR ARCH

ance of the latter due to expansion does not tend to destroy them.

They are easy to install, as they are composed of a very few simple parts, which come all ready to put together. These parts have tongue and groove joints, which hold them rigidly in place.

Tongued and Grooved Firebox Blocks

These blocks are made in three thicknesses: 6, 8 and 9 in.; and in two heights: 12 and 18 in. All sizes come in three lengths: 12, 18 and 24 in.

Their use greatly reduces the number of joints in the furnace wall, which thus exposes a smoother and more durable surface to the action of the fire. Clinkers do not adhere to them as easily as to small brickwork.

They can be laid up, according to individual ideas, for lining the firebox or building bridge walls. For the latter, they will be bullnosed or beveled in any specified way.

Back Combustion Chamber Arch

Foot's combustion chamber arch fits any horizontal boiler. It is carried by the walls of the setting and is not affected by the expansion of the boiler. The clevis arm bar, which can be supported from above, is



FOOTE'S BACK ARCH

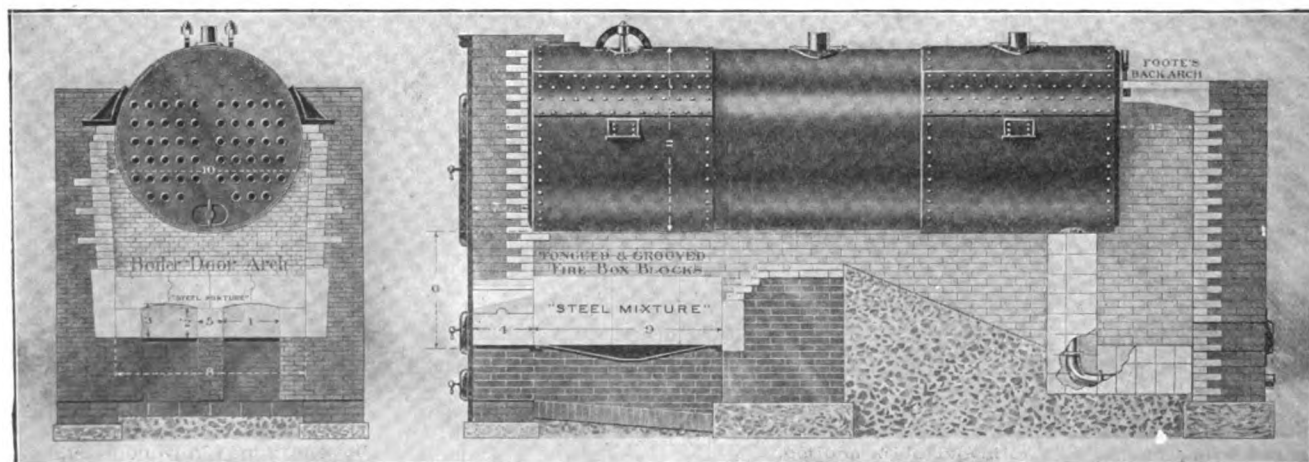
furnished in most cases. The bar is protected by being set in a groove of the material as shown in the illustration. The pieces are shiplapped together so as to produce a gastight joint.

There is ample headroom for working in the combustion chamber, so that once in place the arch should last indefinitely.

Information

The measurements which we require in order to furnish estimates on these arches and blocks are indicated in the illustration below.

Ask for our Furnace Lining Catalogue, which gives detailed information about "Steel Mixture" settings.



Elevation with Front Removed

Sectional Side Elevation

DIMENSION CUT OF "STEEL MIXTURE" FORMS FOR BOILER SETTINGS

CYCLONE GRATE-BAR COMPANY

BUFFALO, N. Y.

NEW ENGLAND AGENT: WALTER H. SULLIVAN, 707 Stevens Street, LOWELL, MASS.

WESTERN AGENT: L. S. SHAW & Co., 5716 Euclid Avenue, CLEVELAND, OHIO.

Products

GRATE BARS, SHAKING and DUMPING GRATES.

Description

The bars are constructed on the clip and truss plan, having two trusses lengthwise; and the clips are bridged across these trusses, each clip forming a double brace with the trusses. No other design can give such a uniform strength to the entire bar. It has no weak spots to warp or buckle. The illustrations will explain clearly the general construction of the grates.

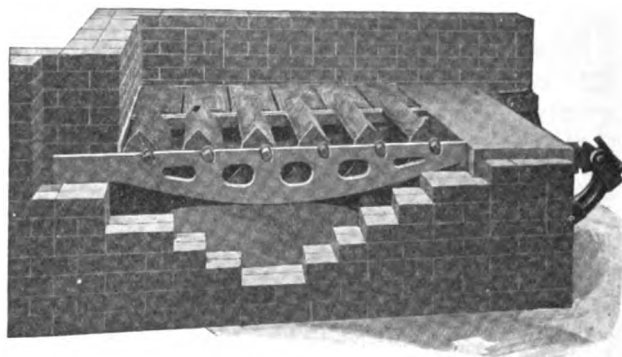
The trusses and clips are beveled from the top side to the underside as follows: The trusses on top side are $\frac{7}{8}$ in. tapering to $\frac{3}{8}$ in. at underside. The clips are $\frac{3}{8}$ in. at face (top) of the bar and beveled to $\frac{3}{16}$ in. at underside. The distance between the clips on the face of the bar is $\frac{3}{8}$ in. and on underside is $\frac{1}{8}$ in.

The bevel has three special advantages: First, all ash passing through the face of the bar must drop directly to the ash pit. Second, the underside openings being nearly twice as large as on the face side, it admits nearly double the volume of air that would pass if the lines between the clips were parallel. Third, there is no friction on the air (draft) until it has reached the extreme top edge of the openings, or face of the bar, thus unbroken currents pass up through unobstructed air spaces, the result of which is too obvious to need explaining. This design is practically equal to a forced draft, as the large volume of air gathered through the larger air spaces at the underside of the grate can not escape except through the top side, at which point it is evenly distributed through the fuel. The bars rest in the frame on chilled axles, which are proof against wear.

The shaking device is strong, simple, and effective. The equalizing bar slides on to the trunnions of the arms, which run down from the ends of the bars, and are secured by cotter pins; while a wrought iron rod 1 in. in diameter connects the equalizing bar with the shaking and dumping arm on the front of the boiler. This arm locks into a lug which is secured to the front of the boiler by cap screws, and is fitted with a cast steel link which drops into a slot and locks the bars level.

The bars can be shaken as vigorously or gently as may be desired, according to the condition of the fire, having a motion of 4 in. up and down without opening the spaces between the bars any farther than when the grate is locked level. No unburnt fuel can drop through it. The "filing movement" of the bars (owing to the fact that they set in the frame eccentrically) cuts the ash entirely off the bottom of the fire, making it possible to maintain the free circulation of air through the fire.

When it is desired to dump the residue of the fire, the shaking lever is pressed downward until the bars are thrown to such an angle that the entire contents of the firebox drop through between the openings, which are then about 4 in. wide, into the ash pit. There are, of course, clinkers which, under certain conditions, no shaking grate can dump; but if the conditions of the firebox, bridge wall, combustion chamber, and grates are such as they should be, heavy clinkers may be avoided, for there is no other grate that will handle clinkers as effectively as the Cyclone.



CYCLONE GRATE BAR IN FIREBOX

Material

It is a common fallacy that any kind of iron is good enough for grate bars, but the very opposite is the case. These grates are made from a mixture of iron which has been found from years of tests and experiments to be best suited for the purpose. We use this grade only. Grates are therefore of uniform quality, and many sets have shown no evidence of burning after 4 years of continual firing 24 hours a day.

Points of Superiority

It admits 68% of the available air.

It can not waste fuel when shaken, as the openings between the bars are no greater when shaken than when locked level.

When the bars are thrown to dumping position the residue of the fire drops directly into the ash pit, clear of all working parts of the grate.

It locks level; can not get out of adjustment. Damage by accident or careless handling has been fully provided against.

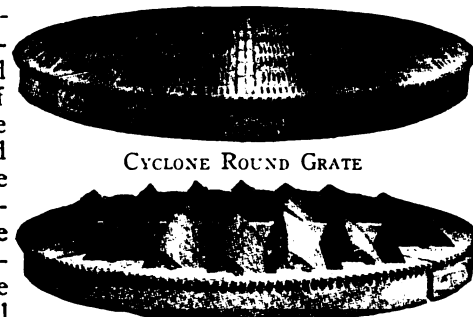
It will burn any kind of fuel; the bar furnished is best suited to the fuel which is cheapest, or most desirable, in any locality.

The bars are so braced and trussed that warping is a practical impossibility. There are no points or fingers to burn off.

The filing movement, when shaken, cuts the ash off without disturbing the fire. Cleans ashes from unburnt fuel without waste.

Evaporation—more water per pound of coal. The heavy smoke is consumed, therefore more perfect combustion is obtained.

Every detail in the construction and equipment of the Cyclone shaking and dumping grate has been studied with the view of conserving the three essential features of simplicity, durability and economy of fuel.



CYCLONE ROUND GRATE BAR IN A DUMPING POSITION

KELLY FOUNDRY & MACHINE CO.

Manufacturers of Furnace Grates, Boiler Fronts and Power Plant Equipment
GOSHEN, IND.

Products

ROCKING, DUMPING and STATIONARY FURNACE GRATES; BOILER FRONTS and ACCESSORIES.

Also manufacturers of Cast Iron Power Plant Equipment.



TRADE-MARK

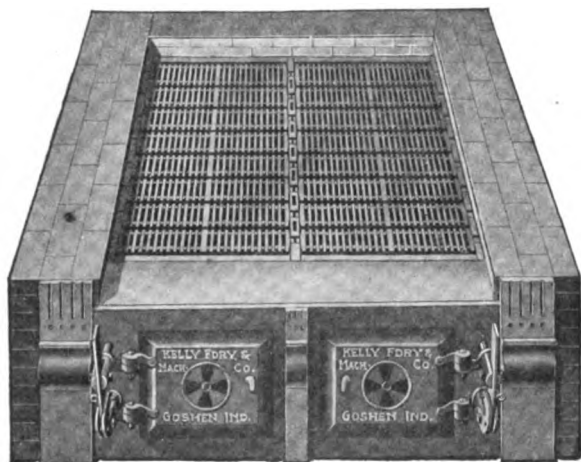
In the Style A grates, all grate bars are of the same size and all the bars in one section are operated by one lever.

Installation—The Kelly grates may be installed where any ordinary stationary grate has been used, without changing supports. They set on regular standard front and rear angle grate rests. The only holes which need be drilled are in the boiler front for the shaker attachment.

Rocking and Dumping Grates (Style A)

Description—The Kelly rocking and dumping grates consist of grate bars arranged in sections in such a way that all the bars in any one section may be rocked slightly to maintain free air circulation, or may be dumped to remove ashes and clean the grates. These operations are performed by means of a lever at the front of the furnace. The rocking motion is confined to a certain limit by a simple locking device, eliminating the possibility of wasting fuel or dumping the grates in the rocking operation; by releasing the lock pin, the grates may be dumped and thoroughly cleaned without opening the fire doors.

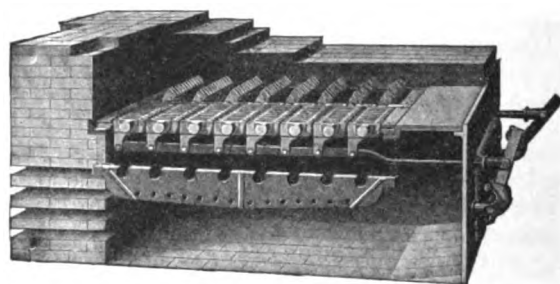
Kelly grates are made to fit the conditions under which they are to work, and the utmost in fuel economy is attained by making the grates with the air opening best suited to the fuel used.



STYLE A. PLATE No. 18
Standard installation

Construction—Thirty-four years' experience in manufacturing grates has led to the development of a grate combining simplicity and ruggedness with maximum efficiency. The design is such as to offer least resistance to the passage of air without detracting from the strength. Parts are few in number and there are no cumbersome or complicated attachments.

High-grade pig iron only is used in making Kelly grates. Experience has shown this material to have the greatest heat resisting qualities. The uniformity of the material causes the grates to expand and contract evenly, thus decreasing the likelihood of warping.



STYLE A. PLATE No. 16
Side-bearing bar removed, giving a clear view of simple mechanical arrangement for rocking and dumping. Each section operated independently

Advantages—A steady, even fire can be maintained by rocking the grates and keeping the air space open. This gives better control of the fires and makes it possible to keep steady steam pressure. Grate bars have a flat surface and therefore operate with greater effect in disturbing and breaking up the fuel bed.

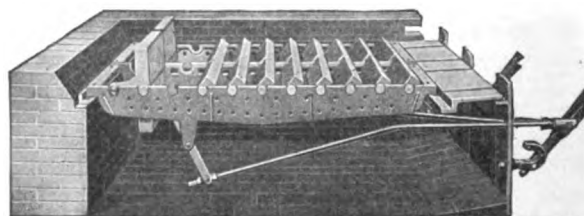
Kelly dumping grates effect a considerable saving in the time required for cleaning. If it is desired to draw the fire, it can be done instantly by dumping the entire fire into the ash pit. The grate surface can be cleaned without shutting down by shifting the fire and dumping one section at a time.

Fuel can be burned more efficiently on Kelly rocking grates than on the ordinary stationary grate. Actual tests have shown a saving of from 5% to 25% in fuel. They will burn any kind of fuel and burn it up clean.

No alterations are necessary in a regular furnace when installing Kelly rocking grates. Their construction is so simple that an ordinary mechanic can install them.

Rocking and Dumping Grates (Style B)

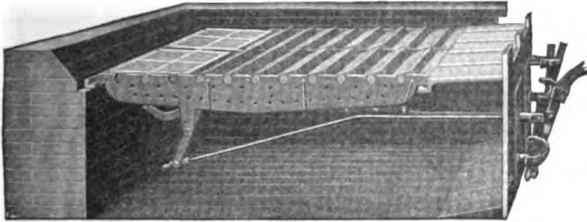
This style differs from Style A, in that a larger dumping grate is fitted at the rear of the furnace. This



STYLE B. PLATE No. 22
Full dumping position with 18-in. rear dump

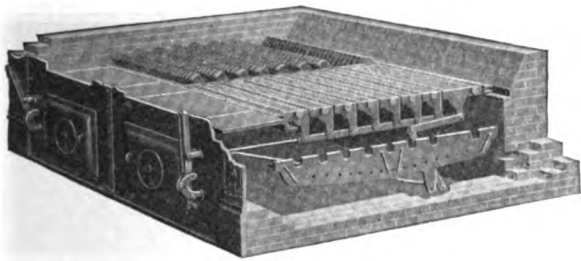
large grate operates independently of the smaller grate bars.

Style B grate has all the good features of the Style A grate and has the additional advantage that all large clinkers and residue of combustion which accumulate next to the bridge wall may be readily removed by means of the large dumping grate.



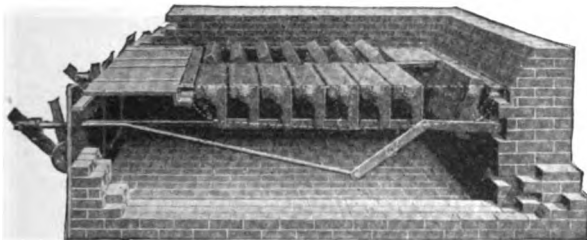
STYLE B. PLATE No. 23

Rocking motion with rear dump grates locked in level position. With use of lock pin in shaker stand each section of grate can be locked in level position, 18-in. rear dump



STYLE B. PLATE No. 15

Grate surface 5 ft. long by 5 ft. wide. One side-bearing bar removed from normal position to give view of mechanical arrangement of rocking and dumping operation. The shaking attachment is made at right- and left-hand sides. Each section requires two levers to operate



STYLE B. PLATE No. 13

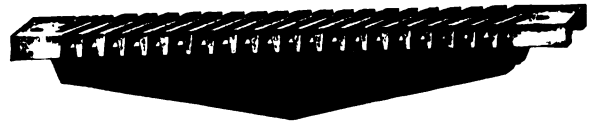
Front sections of grate surface are operated independently from double-capacity rear dumping grates, giving fireman every advantage for perfect control of fires. The dumping operation is accomplished by removing lock pin from shaker stand. 12-in. rear dump

Sizes, Styles A and B—Standard sizes run in even feet and half feet in both width and depth, and are carried in stock.

Grates are furnished for any size area and any number of sections wide on receipt of order, at no extra price per square foot.

"Kelly Improved" Grates, Stationary

The air opening is continuous from one side of the furnace to the other, admitting 10% more air than any other grate. No dead surface. An equal volume of air to every square inch of the surface.



THE "KELLY IMPROVED" GRATE

Standard width 6 in., any length. Air openings $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$ and $\frac{7}{8}$ in.

The side, or support bar, does not come to the fire surface, but is 1 in. below it. This allows a draft circulation above the side bar, which keeps it cool and protects the strength of grate from the direct action of the heat, therefore it can not sag nor warp.



SECTION "KELLY IMPROVED" GRATE

Boiler Fronts and Trimmings

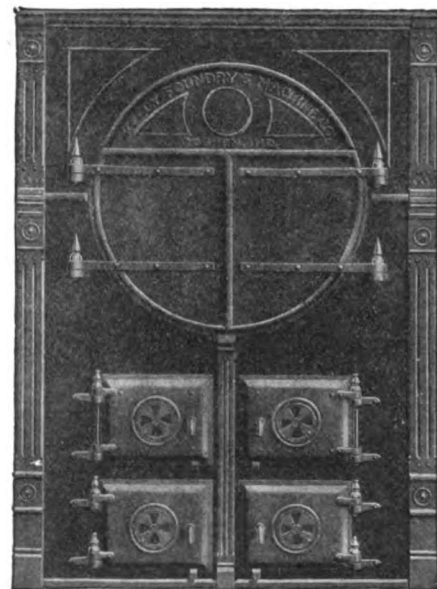
Design, style and sizes of the Kelly boiler fronts and trimmings have been established for years and conform to the average power plant equipment. Many patterns have accumulated and special work can be furnished on short notice.

Pattern and machine shops are well equipped to handle work from blue print or sketch.

Complete setting consists of front proper, fitted with flue, fire and ash doors, baffle plates fitted to fire doors, dead plate and liners, rear grate rest and grates, rear arch rest and arch bars, buckstays and diamond washers, soot door and frame, breeching frame and damper. Front accurately fitted and lettered.

Styles and Sizes—Ten different regular styles: full arch and half arch fronts; Dutch oven fronts; smoke extension fronts; full and half creamery fronts.

Sizes: 30 to 84 in.



STANDARD NO. 1 BOILER FRONT

Catalogues

Foundry catalogue is "H."

Grate catalogue is "C."

MARION MACHINE, FOUNDRY & SUPPLY CO.

Manufacturers of Boiler Room Specialties

P. O. Box 995
MARION, IND.

Products

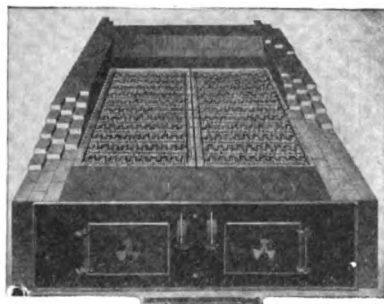
SHAKING GRATES: Interlocking and Non-interlocking.

HAND FIRED STOKERS; SOOT BLOWERS; COAL CRUSHERS.

Also manufacturers of Bagasse Grates; Power Plant Specialties; Coal and Coke Handling Machinery; Oil Well Machinery.

Shear-Klean Grates

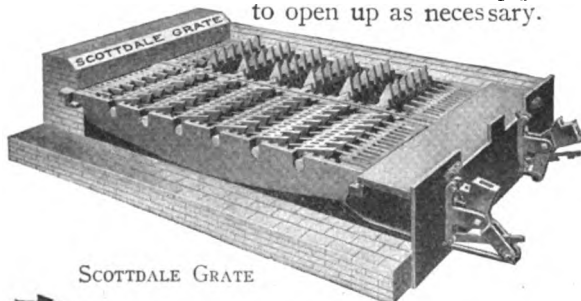
So named because of their lateral shearing action. When grates are moved fore and aft, alternate bars cause a shearing action, crushing the hardest clinkers without disturbing fuel bed above. Shear-Klean grates are built strongly and have stood the most severe tests wherever used. Levers placed at door of firebox make it an easy task to clean the fire of all ash and clinker.



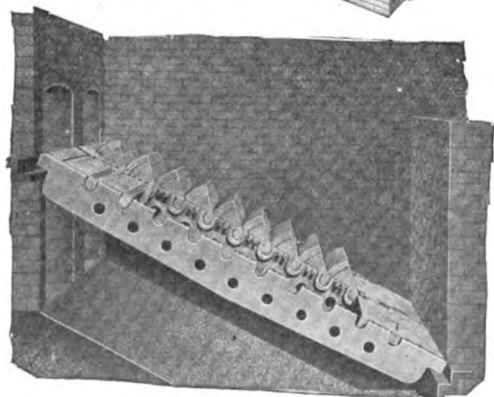
SHEAR-KLEAN GRATE

Scottdale Grates

With Scottdale grates, the fireman can brighten up the fire, and sift out the ash by lifting the top latch of the fulcrum bracket and rocking the grates through a limited arc without increasing any opening of the grate. He can remove the clinker by lifting the latch attached to the bottom of the fulcrum bracket and allowing grates to open up as necessary.



SCOTSDALE GRATE



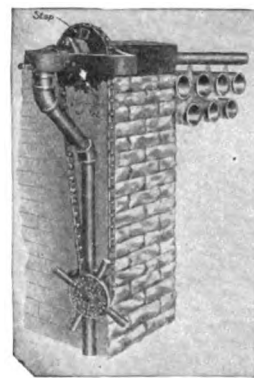
MARION HAND FIRED STOKER

Marion Hand Fired Stokers

The most economical method of firing bituminous coals is the stoking method, in which coal is placed at front of grates and volatile gases distilled off gradually, and fuel then worked forward on the grates until the carbon is consumed and only ash and clinker remains. Marion hand fired stokers will handle lignites and low grade coals that slack and do not coke. A simple manipulation of levers at the fire doors is all that is necessary.

Planet Soot Blowers

Designed for all types of water tube boilers, including vertical, horizontal and marine. The internally welded nozzles form an integral part of the blowing element and are so spaced as to clean the entire tube surface. These blowers are easily operated by a special hand wheel control which gives them a steady rotating movement.



PLANET SOOT BLOWER

Marion Rotary Soot Blowers

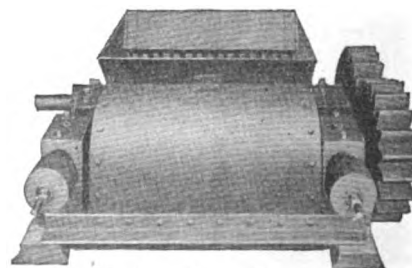
These single jet type blowers deliver a small volume of steam at high velocity through the flues, driving out all loose ash and soot. Steam nozzle contains a number of steam ports having different angles. Whole nozzle is rotated upon its axis, which allows each port to successively direct a steam jet against a fixed section of the flue area. Nozzles are made of a special mixture of cast iron which stands high temperatures.



MARION ROTARY SOOT BLOWER

Marion Coal Crushers

Made in sizes to crush bituminous, semianthracite and bone coals and give a product from $\frac{3}{4}$ to $4\frac{1}{2}$ in. To accomplish this adjustment for various sizes of product, one roll is made floating or adjustable and is driven by special long tooth gears to insure proper meshing of teeth when roll is set for fine or coarse crushing. All rolls fully guaranteed.



MARION COAL CRUSHER

ESTABLISHED 1874

NEEMES BROS., INC.

Manufacturers of Furnace Grates

100 First Street

TROY, N. Y.

AGENCIES

NEW YORK, N. Y., W. B. CONNOR, INC.
 PHILADELPHIA, PA., PRALATT EQUIPMENT
 Co.
 BALTIMORE, MD., WALLACE STEBBENS &
 SONS

CHICAGO, ILL., G. W. HEALD, M.E.
 PROVIDENCE, R. I., BURKE ENGINEERING
 Co.
 COLUMBUS, OHIO, HAYES ENGINEERING Co.
 MONTREAL, QUE., BARCOCK & WILCOX, LTD.

ST. LOUIS, MO., E. W. MURRAY
 CLEVELAND, OHIO, R. B. CLAPP & Co.
 EAST LIVERPOOL, OHIO, MACBAR SUPPLY
 Co.

Products

SHAKING and DUMPING GRATES.
 Also Straight Dumping Grates; Stationary Grates.

Suitable for Burning All Kinds of Fuel

Neemes improved shaking and dumping grates are built to fit *rectangular* and *circular* furnaces of internally and externally fired boilers and can be installed without alteration of brickwork. Legs as shown in illustration are optional.

Grates are suitable for all sizes and grades of anthracite and bituminous coal, slack, lignite, tan bark and admixtures of coal and sawdust.

Construction and Operation of Neemes Shaking and Dumping Grates

Framework—Consists of one or more pairs of generously proportioned and advantageously shaped bars. One bar of each pair has holes for shaker journals to rest in, the other having special shaped recesses to hold *patented lock boxes*. Side bars rest on the usual bearing bars and support the shakers which constitute the body of the grate and are held at proper spacing by means of perforated tie bars which fit into indentations formed in the ends to receive them. This arrangement prevents binding of shakers and provides ample end play to care for all expansion, thus avoiding warped or broken castings.

Shakers—Made of special iron and cast integral. About 6 in. wide on face and of suitable length for the furnace; air spaces and teeth properly proportioned for fuel used. Lugs for attachment of connectors and shaking rods are incorporated in shaker.

Lock Boxes—Shakers are held in place by *patented lock boxes*, an exclusive Neemes feature. This simple device prevents the shaker being forced up into the fire and burned, yet permits full freedom of motion of journals in their bearings. Their removal is a simple matter if lock is first lifted from side bar recess.

Wall Bars—Provided when necessary to fit between side bars and furnace walls. They protect side bars, take care of unevenness of walls and permit grate width to be varied if necessary.

Shaking Arrangement—Brackets and toggles for the reception of shaking handles are easily attached to boiler front and occupy little space. Grates are built in 1, 2, 3, 4 or 6 sections, depending on size and re-

quirements. Furnaces up to 3 ft. 4 in. wide and 5 ft. long are usually built in one section (all shakers being operated simultaneously by a single rod). Larger sizes are so connected as to permit shaking or dumping one-half or one-quarter of the fire at one time.

Dominant Features of Neemes Grates

Patented lock box holds shakers in place and prevents their being forced up into the fire and burned, yet does not interfere with ready removal of shakers.

Fire shaken and dumped with very little effort. Dead air spaces reduced to a minimum. No special setting required, as grates rest on usual bearing bars or dead plate lip. All castings spaced to allow ample side and end play, preventing warping and buckling.

Clinkers cut and crushed in center of concave surface of teeth and not on the point—no broken teeth result. Clinkers cut and ashes shaken out without breaking up fuel bed or loss of unburned fuel; periodical slicing of fires is not necessary.

Grates do not clog with ashes, as air slots are widened out below the surface, permitting any ash small enough to pass top space to fall into pit.

No screws or bolts are used in grate proper,

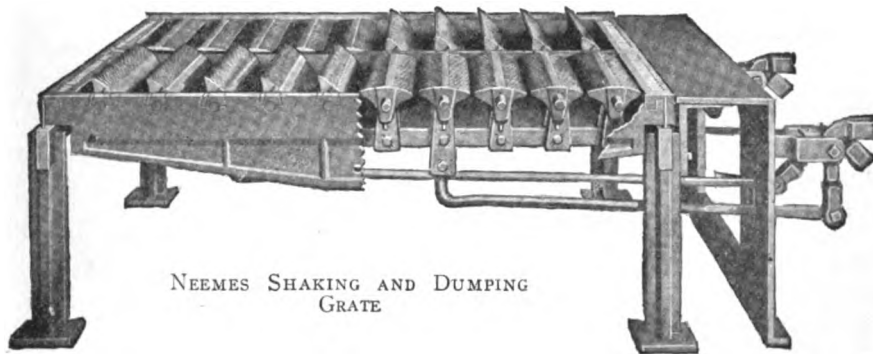
thus removal and replacement of parts is greatly facilitated.

Service Record of Neemes Grates

Neemes grates have been performing satisfactory service for the past twenty-five years and have been installed in boilers representing over 250,000 h. p.

The names of a few of the many users of these grates follow:

Adirondack Electric Power Corp.	Loft, Inc.
American Tobacco Co.	P. Lorillard Co.
American Blower Co.	Ludlum Steel Co.
Borden's Condensed Milk Co.	Ludlow Valve Works
Baltimore & Ohio Railroad Co.	Manning Paper Co.
Celluloid Co.	McKesson & Robbins
Cluett, Peabody & Co.	New York Central Railroad Co.
Central Leather Co.	Packard Motor Car Co.
Delaware & Hudson R. R. Co.	Pratt & Lambert, Inc.
Eastern Malleable Iron Co.	Pennsylvania Railroad Co.
Earl & Wilson	Rail Joint Co. of America
B. F. Goodrich Rubber Co.	Rutland Fire Clay Co.
General Electric Co.	Schules Grape Juice Co.
W. & L. E. Gurley	C. C. Smoot & Sons Co.
Horton Ice Cream Co.	Sweet, Orr & Co.
International Harvester Co.	Sears, Roebuck & Co.
Geo. P. Ide & Co.	U. S. Leather Co.
Lehigh Valley Railroad Co.	Van Raalte Co.



NEEMES SHAKING AND DUMPING
 GRATE

WASHBURN & GRANGER, INC.

Manufacturers of Grate Bars, Incinerators and Ash Can Hoists

50 Church Street
NEW YORK, N. Y.

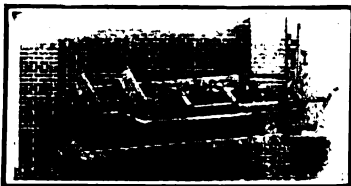
BRANCH OFFICE: 141 Milk Street, BOSTON, MASS.
WORKS: MYERSTOWN, PA.

Products

DUMPING and SHAKING GRATES; FIRE BRICK LININGS for boiler furnaces; ASH CAN HOISTS: Telescopic, Air, Steam, Hydraulic, Electric or Hand Power; INCINERATORS.

Also manufacturers of Boiler Castings and Fronts, steel and cast iron; Boiler Room Floor Plates; Ash Hopper Gates; Flat Suspended Arches; Blast Gates; Ash Cans; Manhole, Trench and Sump Pit Covers, Frames and Plates; Ash Pit or Cleanout Doors; Side-walk Safety Doors and Door Opening Devices; Metal Ladders; Wood Patterns; Cast Iron Industrial Track; Cut-off or Hopper Valves.

"Dean" Dumping Grates

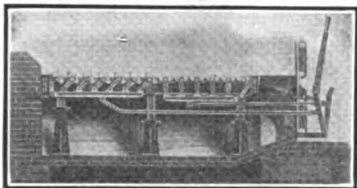


"DEAN" DUMPING GRATE

Built for burning the small sizes of anthracite coal with either natural or forced draft. Bars tip in tandem to an angle of 65° and are supported at both ends by a rectangular frame which eliminates entirely the tendency of the bars to hang downward on the ends. Air spaces, $\frac{1}{8}$ to $\frac{3}{8}$ -in. slot, also built in the pinhole form with $\frac{1}{4}$ or $\frac{1}{8}$ -in. diameter openings. Fires can be cleaned in one-half the time required with stationary bars.

Catalogue No. 7 on request.

"Dean" Shaking Grates



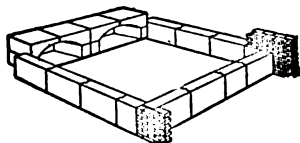
"DEAN" SHAKING GRATE

Used for bituminous and the larger sizes of anthracite coal, both fuels requiring a grate with an oscillating or shaking movement. Supported by a frame resting on the ash pit floor independent of the brickwork, with bars placed on 8-in. centers, allowing ample opening for the largest clinkers. Journals self-locking, requiring no caps. The sides of the bars are made solid, which is a necessity, as 90% of the wear comes along these edges. Construction is of the most durable form, to withstand hard service.

Catalogue No. 7 on request.

"Dean" Fire Brick Linings

Made to withstand 3200° Fahr. of furnace temperature.



"DEAN" FIRE BRICK LINING

Standard side and bridge wall blocks are 24x18x8 in., with tongue and groove ends, thus minimizing number of joints and burning of furnace walls.

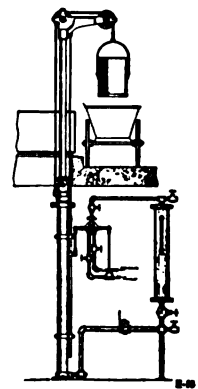
"Dean" Ash Can Hoists

Type A Hydro-steam Hoist—Will lift a can of ashes or other material to the street level quickly by means of steam at 70 lbs. pressure.

Operating valve simple in construction.

Piston of polished steel tubing; cylinder of lap welded pipe.

Mechanism connecting the piston with the pressure valve, automatic in action, is provided to retard the speed and stop the piston without shock at the extreme limits of the up or down stroke, independent of any action on the part of the attendant.

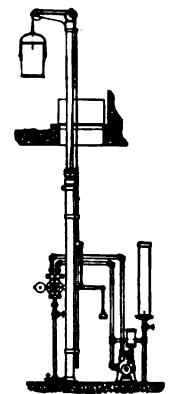


"DEAN" TYPE A
HYDRO-STEAM
ASH CAN HOIST

Type F Electro-hydraulic Hoist—Rope geared 2 to 1. The crosshead is of cast iron and is rigidly attached to and rotates with the steel piston in the cylinder head from the position of hoisting through the area opening to a position over the wagon.

The electric motor is coupled direct to the rotary pump, mounted on a bed-plate of cast iron to secure perfect alignment of parts.

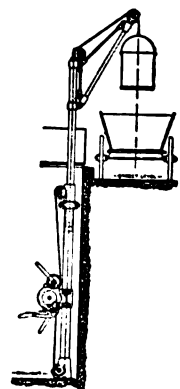
The pressure medium is mineral oil, which prevents freezing.



"DEAN" TYPE F
ELECTRO-HYDRAU-
LIC ASH CAN
HOIST

Type D Hydraulic Hoist—Operates at 70 lbs. water pressure. A single, 3-way, balanced controlling valve is introduced and arranged to automatically retard and stop the hoist at extreme limits of upper and lower levels.

Type B Hand Operated Telescopic Hoist—Intended for ordinary service and for a maximum capacity of 300 lbs. When hoist is not in service the spar is telescoped within the mast.

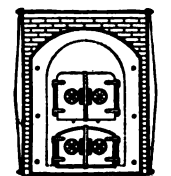


"DEAN" TYPE B
HAND OPERATED
TELESCOPIC
ASH CAN HOIST

Incinerators and Destructors

We have patterns and designs for incinerators for burning rubbish and waste material, suitable for institutions, hotels, schools, apartment houses, museums, factories, etc.

Send for catalogue No. 9 "Incineration."



INCINERATOR

McCLAVE-BROOKS COMPANY

Manufacturers of McClave Combustion Systems

SCRANTON, PA.

BRANCH OFFICES

NEW YORK, N. Y., A. R. ST. JOHN, Mgr., 1502 Printing Crafts Building
CHICAGO, ILL., F. G. SMITH, Western Mgr., 515 Hearst Building
PITTSBURGH, PA., H. L. HERGETT, Mgr., 1623 Oliver Building
SYRACUSE, N. Y., W. H. GOODRICH, Mgr., 130 Hope Avenue
DETROIT, MICH., A. H. SLOAN & Co., INC., Reps., 410 Moffat Building
CINCINNATI, OHIO, H. S. HOLMES, JR., Rep., 511 Gwynne Building

PHILADELPHIA, PA., GEO. BLAIR, JR., Mgr., 610 Morris Building
BOSTON, MASS., T. W. JENNINGS, Mgr., 261 Franklin Street
DALLAS, TEX., D. G. COUNTS, Mgr., 705 Elm Street
GREENVILLE, S. C., J. C. SANDERS, Mgr.
JACKSON, MISS., W. C. CHRISTENSEN, Mgr., 123 Calhoun Street
SALT LAKE CITY, UTAH, C. H. JONES Co., Reps., 501 Dooly Building

Products

McCLAVE AUTOMATIC STOKERS; McCLAVE SEMI-AUTOMATIC STOKERS; McCLAVE HAND FIRED STOKERS; McCLAVE GRATES; the ARGAND STEAM BLOWER; EXPANSION BOILER FRONTS.

McClave Semi-automatic Stokers

These stokers are made in two types, "M-A" for burning the very fine sizes of anthracite; and "M-B" for burning bituminous slack, both coking and non-coking, and mixtures of bituminous with anthracite screenings or coke breeze in varying quantities.



stokers, is equipped with the McClave sectional top grates, which make replacement of burned-out sections easy and greatly reduce maintenance cost over solid type grate bars.



Argand Steam Blower

In addition to the advantage of a blast mixed with steam, which will soften clinker formation, the Argand steam blower is exceedingly economical of steam because of its scientifically prepared design.

Used in combination with McClave stokers or grates, it forms a very effective combustion system.

McClave Design and Service

Every part of any McClave system has been carefully designed and built to take care of expansion and contraction through short lines of metal and proper reinforcement. Only the best materials are used in a plant where every process is controlled by the manufacturer, and where the highest workmanship has been a tradition for more than 40 years.

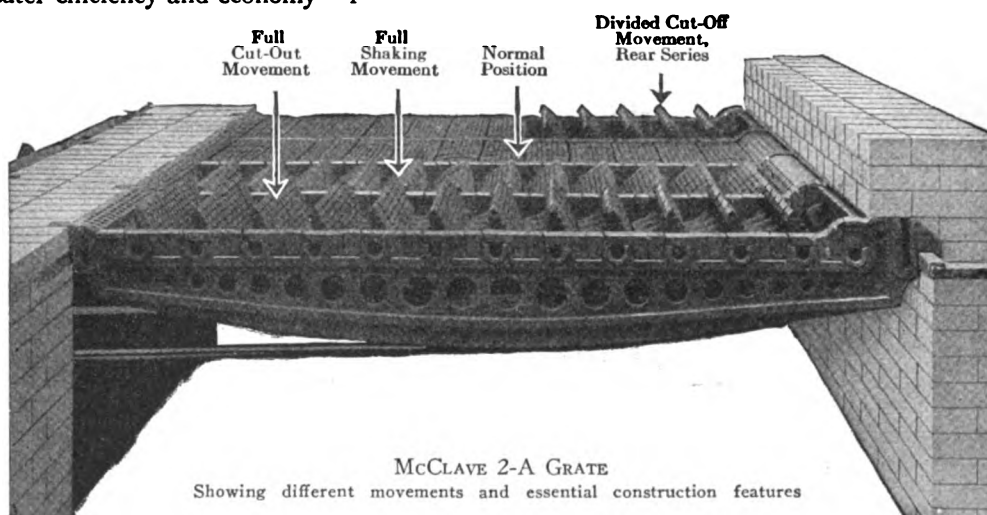
An Engineering Department is maintained for the service to clients and the solution of fuel and combustion problems.

McClave 2-A Grate

McClave 2-A grate is the latest development of McClave shaking and cut-out grates, and is designed for use in plants where space limitations prevent installation of stokers, but where greater efficiency and economy are essential. Like all McClave grates, this equipment can be operated with full cut-out movement, full shaking movement, or divided cut-out and divided shaking movement.

McClave Hand Fired Stokers

Can be had equipped to burn any kind of bituminous coal, lignite, bagasse and various combinations, as desired. This, like the automatic and semi-automatic



AUBURN FOUNDRY CORPORATION

SUCCESSORS TO MARION FOUNDRY CORPORATION

Manufacturers of Stokers and Shaking Grates

AUBURN, IND.

Products

The AUBURN HAND STOKER.
The CLEAR-CUT GRATE.

Auburn Hand Stoker

This stoker moves the fuel bed forward about 4 in. on one full stroke of the stoking movement. No steep

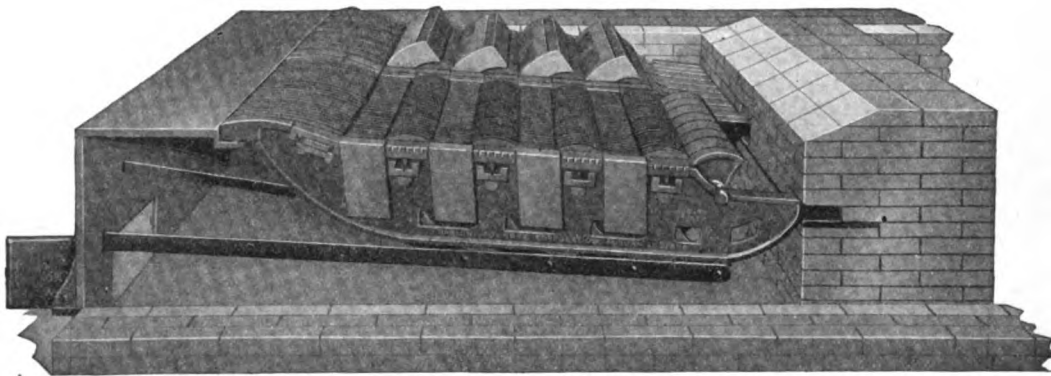
incline is necessary; stokes on a level just the same as on an incline.

It also embodies the following features:

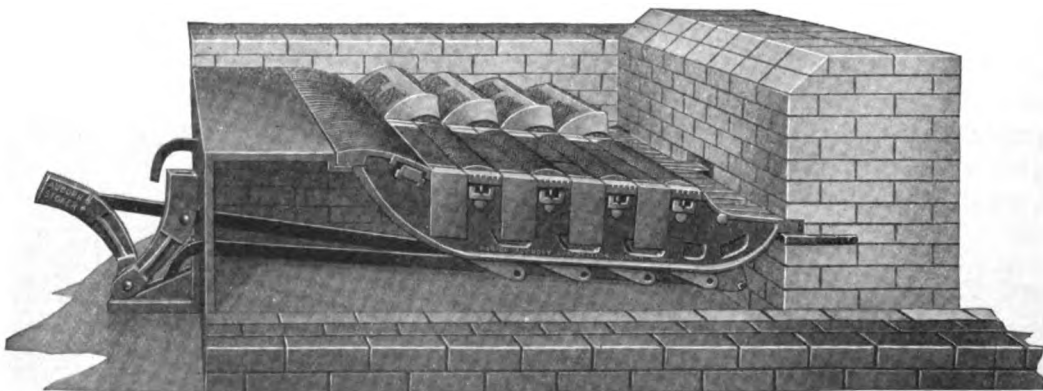
Sectional top throughout, stoking units counterbalanced, all units locked into side frames.

Weight about 110 lbs. per sq. ft.

Both of the views below show the stoker installed in an ordinary firebox having 24-in. ash pit. No deep excavation is necessary.



THE AUBURN STOKER, SHOWING ONE SECTION IN ONE-HALF STOKING POSITION



ONE SECTION OF THE STOKER IN FULL STOKING POSITION

Clear-Cut Grate

The Clear-Cut grate has the four following positions:

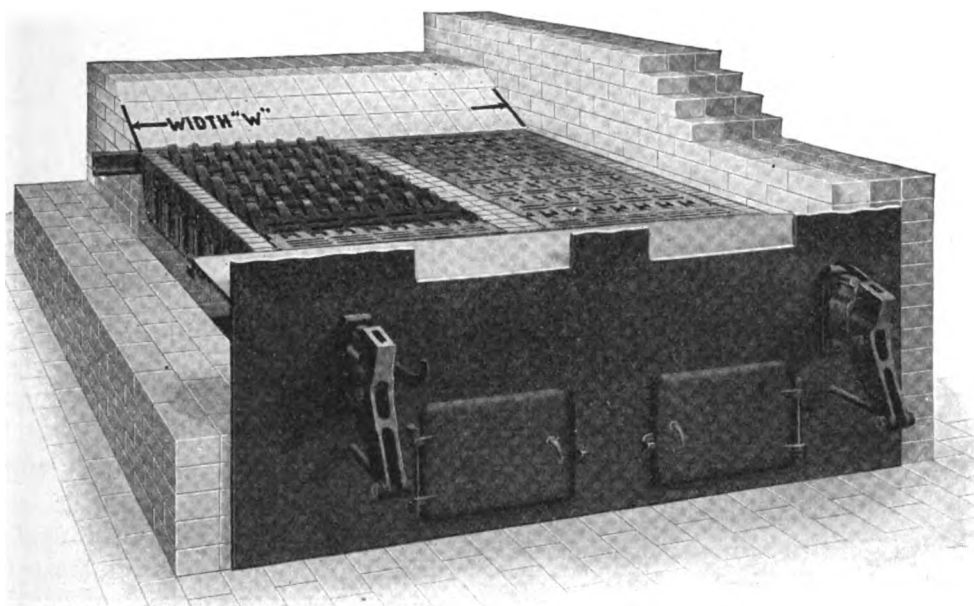
Level, ash-sifting, clinker-cutting, full-dumping.

The action, as indicated by the position of the grate in the first illustration below, is obtained by throwing the latch backward.

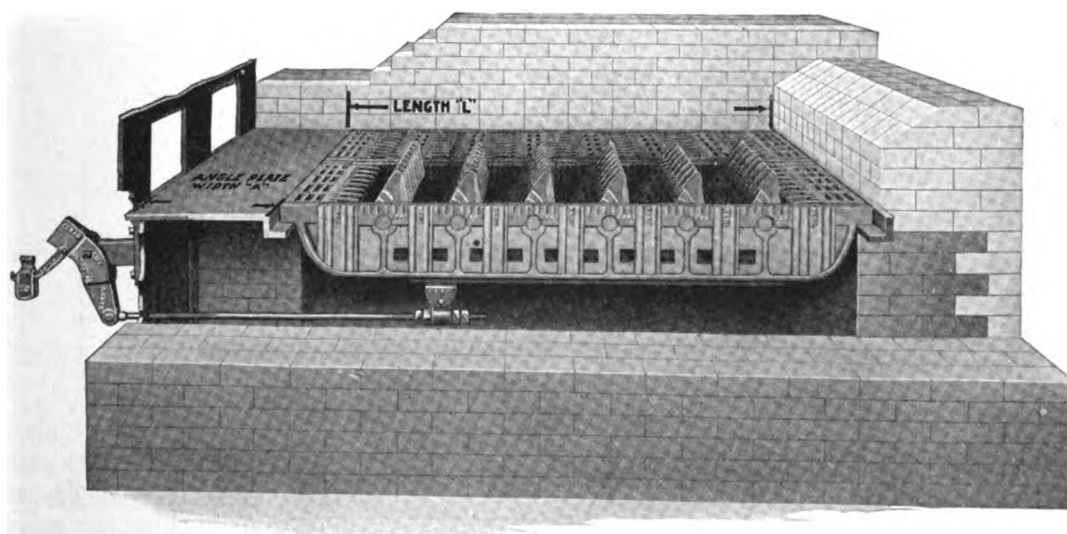
The action, as indicated by the position of the grate in the second illustration, is obtained by lifting the lever stop casting from fulcrum post, giving a 5-in. dumping clearance along the full length of the rocking bars.

Catalogue

Catalogue furnished on request.



FRONT VIEW OF CLEAR-CUT GRATE—ONE SECTION IN CLINKER-CUTTING POSITION



SIDE VIEW OF CLEAR-CUT GRATE IN FULL-DUMPING POSITION

THE AUTOMATIC FURNACE CO.

DAYTON, OHIO

Products

MODEL AUTOMATIC SMOKELESS FURNACE; MODEL CHICAGO CHAIN GRATE; DAYTON COAL FEEDER; CULVER SHAKING and DUMPING GRATE; MODEL ACME STEAM ENGINE.

Co-operative Service

This company will gladly co-operate with consulting engineers, architects, owners, managers, operatives, and all who have to do with steam power, heat or light plants and will gladly furnish such detailed information as may be desired to determine the practicability of any proposed installation.

Model Automatic Smokeless Furnace

The Model Automatic smokeless furnace is so designated because it is an improved form of the side-feed type and embodies greater utility than any other make or type.

The devices for getting rid of the ash have been so designed and perfected that the furnace keeps the fire clean all the time.

The principal parts of the furnace are not exposed to damage and will last a lifetime. The grates are in pairs, one piece of each being stationary and the other movable.

Illustrations show the narrow surface of each grate that is exposed to the heat and the broad surface on which the air acts and cools as it is drawn into the fire bed.

Each pair of grates can be renewed separately and each section of the bar that grinds up and discharges the

Draft—The Model Automatic furnace operates with either natural or induced draft.

There are Model Automatics where ample draft is available that have crowded 500 h.p. boilers to 1500 h.p., for days at a time, maintaining a clean stack.

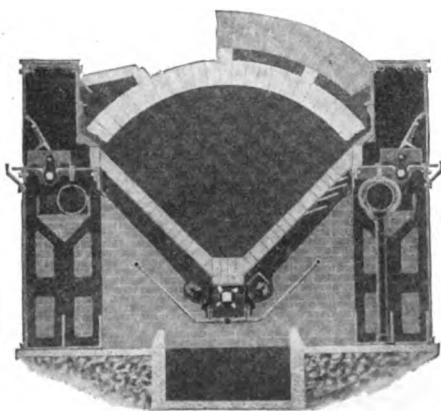
Automatic Regulation—A combination draft and fuel feed regulator can be applied, so that the rate of fuel feed, air supply and combustion correspond to the steam requirements.

Ash Handling—No other mechanically operated furnace lends itself more advantageously to economic use of mechanical coal or ash handling. The clinker and other coarse refuse is broken up, so the ash is in suitable condition for any desired method or system of ash handling.

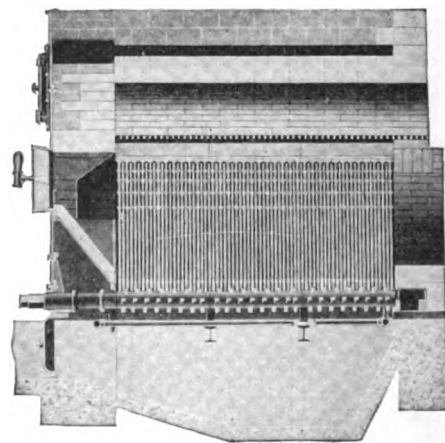
Repairs—The construction and arrangement of the Model Automatic furnace provides for maximum self-protection to all parts subject to damage by heat or wear, and there is therefore a minimum cost of maintenance. The fuel saving is sufficient to pay for the necessary repairs and also to give a large return on the cost of installation.

Operation—A small steam engine or electric motor is furnished with each furnace, battery, or row of furnaces driven through a set of double worm gears, thus giving ample power with use of little steam.

Mechanisms for operating both the stoking and cleaning arrangements are on the outside of the front, not exposed to the heat of the fire. Each part can be



CROSS SECTION THROUGH MODEL AUTOMATIC SMOKELESS FURNACE SHOWING SINGLE AND DOUBLE ARCH CONSTRUCTION



LONGITUDINAL SECTION THROUGH CENTER OF MODEL AUTOMATIC FURNACE

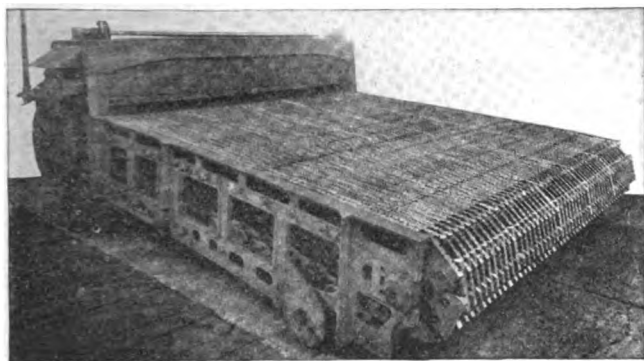
clinker and coarse refuse can be renewed separately and, if necessary, without putting the furnace out of commission or seriously interfering with its operation.

Air enters the fire chamber and is so admitted as to avoid overheating of the fire arch, arch plates and other parts, and insures instantaneous, complete combustion.

disconnected or connected without stopping engine or motor. Motion of clinker grinder can be varied to suit amount of refuse in the coal by simply pulling out a single pin and replacing it in the desired position, to keep the fire clear of refuse and not waste combustible in the ash.

Model Chicago Chain Grate

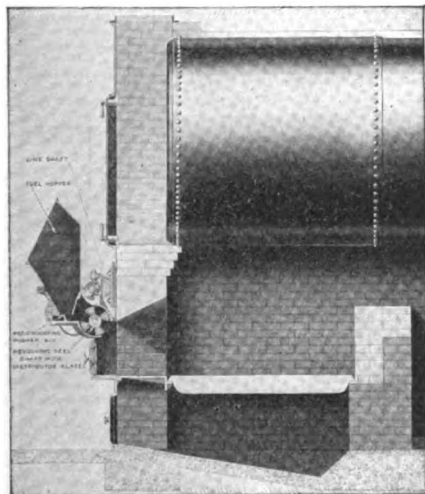
This company also manufactures the Model Chicago chain grate. It is of rugged, heavy construction and is designed to stand the trying service of boiler room equipment. Detailed description will be gladly sent on request.



MODEL CHICAGO CHAIN GRATE

Dayton Coal Feeder

The Dayton coal feeder is designed to meet the requirements of small boilers. It gives a constant, light feed of coal and an even distribution over the grate surface, which results in increased efficiency and capacity, and the elimination of the *smoke nuisance*.



DAYTON COAL FEEDER ATTACHED TO SMALL BOILER

Practically foolproof, it reduces the amount of labor required and assists in eliminating the human element. As it is not exposed to the heat of the fire, maintenance is nil.

Culver Shaking and Dumping Grate

Has both a shaking motion, which is sufficient to clean the grate surface of ash and clinker, and a dumping motion in which every other grate raises up and the others drop down. When in this position the grates can be rocked, which will break up the largest and hardest

of clinker, and as an 8-in. opening is afforded everything on the grate is dumped into the ash pit.



CULVER SHAKING AND DUMPING GRATE

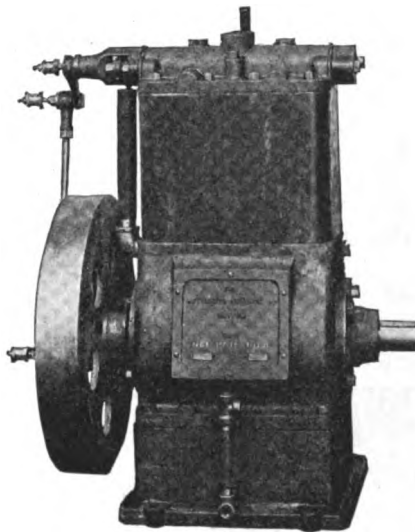
The fire surface is made up of small clips which slip on to the bar and lock in position. As the grate is of substantial design, maintenance is reduced to a minimum.

Model Acme Steam Engine

Uses—There are now thousands of Acme engines in operation, and owing to their rugged construction, simple and durable design, they have no equal, operating as they do with the minimum amount of attention.

Description—Engine is of the single acting, two-cylinder type. Designed to operate under a steam pressure from 80 to 200 lbs. and a speed of 150 to 600 r.p.m. A pair of vertical cylinders are placed above an enclosed crank case which serves as a rigid foundation for the engine as well as a reservoir for the oil used in the automatic splash system of lubrication.

It is provided with generous sized ports for quick inlet and exhaust of steam. Valve is a one-piece casting ground to fit an accurately bored chamber, the latter piece also serving as a cylinder head. Automatic relief valves are provided in the top of the cylinder head to insure quick release of any water which may collect in



MODEL ACME STEAM ENGINE

the cylinders, thereby eliminating any chance of damage from this source.

All bearings of this engine are of ample size and are continuously lubricated by a positive splash system contained in the crank case.

DETROIT STOKER COMPANY

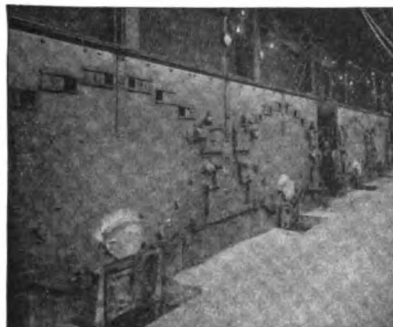
7346 Woodward Avenue
DETROIT, MICH.

Product

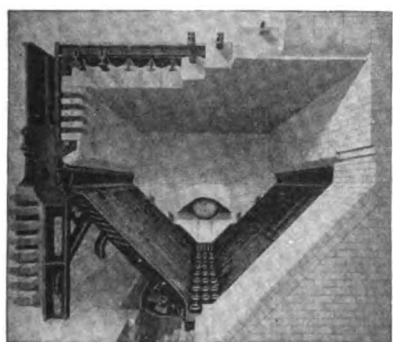
DETROIT STOKERS: V-type Natural Draft; Single Retort Underfeed; Multiple Retort Underfeed.

Detroit V-type Natural Draft Stoker

Adaptability—For all natural draft boilers from 100 h. p. up. Burns all grades of bituminous coal, wet tan bark, bagasse and other refuse.



Front View



Rear View
V-TYPE STOKER INSTALLATION

Economic Advantages—Eliminates human factor always present with hand firing. Hand fired plants average 50% to 55% over-all boiler efficiency; boilers fired by Detroit stokers average 70% to 75% and over. With hand firing one fireman can take care of 250 to 500 h. p. of boilers; with Detroit stokers one man can handle 2000 to 3000 h. p. Smokeless operation. Burn cheaper grades of fuel than is possible with hand firing, thus paying for several times their cost each year.

Method of Operation—Coal stored on top of stoker feeds by gravity through magazines on both sides to grates. Fuel bed moves down toward clinker crusher at bottom center.

Special Features—Large coking surface per rated boiler horsepower. Requires little power for operation. Properly proportioned. Substantially built. Maintenance cost low. Ask for Bulletin 346.

Detroit Single Retort Underfeed Stoker

Adaptability—For forced draft with boilers developing up to 350 to 400 h. p. Burns all grades of bituminous coal.



FRONT VIEW OF SINGLE RETORT
INSTALLATION

Economic Advantages—Same as V-type above.

Method of Operation—This single retort stoker possesses the very great advantage of horizontal retort and tuyeres. It is side-cleaning. Dump is hand operated and refuse can be removed either through

ash doors in front, or delivered below to hopper or ash conveyor. Arrangement for admitting air, under control through specially designed tuyeres at both sides of retort, produces a high overload on quick demand. Regulation of feed of coal and removal of clinker and ash are both accomplished without interference with stoker operation.

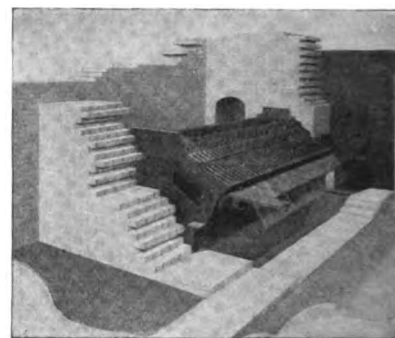
Special Features—Other features include an adjustable ram operated by reduction gears from shaft below, driven by small engine or motor. All gears, worms and moving parts are fully enclosed, running in oil and are easily accessible. Simplicity of design without any moving parts in the fire, insures a minimum maintenance cost. Ask for Bulletin 246.

Detroit Multiple Retort Underfeed Stoker

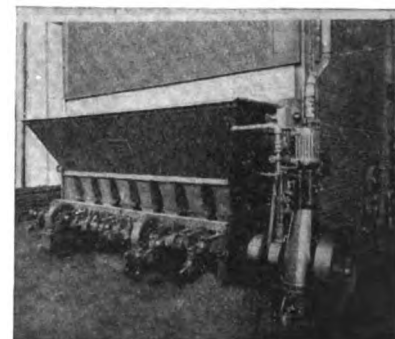
Adaptability—For all large boilers with forced draft. Burns all grades of bituminous coal.

Method of Operation—Stoker has a level fuel bed, which does away with the causes of uncertainty of fuel movement. Positive feed of fuel is provided, giving for first two-thirds of travel an upward and rearward movement, and for remaining one-third a horizontal push to dumping device. Retorts and tuyeres are placed horizontally, and thickness of fuel bed, together with rate of movement to rear, are at all times entirely under control of operator.

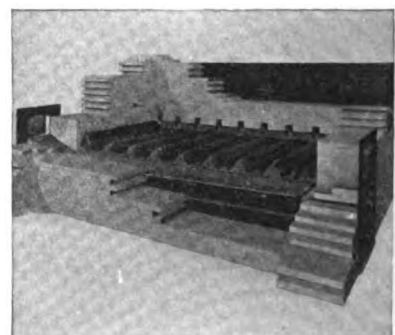
Special Features—Fuel is delivered to retort by means of heavy crank driven rams. Connecting rods operate through specially designed boxes provided with lost motion arrangement which permits adjustment of length of travel of ram from no movement to full stroke. This permits instant release of any ram, or all the rams can be run at short stroke for very light loads. When fires are banked, all rams can be left standing in, preventing back-firing to hoppers. Bulletin 146.



REAR VIEW OF SINGLE RETORT
INSTALLATION



Front View



Rear View
MULTIPLE RETORT INSTALLATION

FURNACES AND STOKERS

MURPHY IRON WORKS
DETROIT, MICH.

SANFORD RILEY STOKER CO.
WORCESTER, MASS.

BRANCH OFFICES FOR BOTH COMPANIES

BOSTON, MASS.
CINCINNATI, OHIO

NEW YORK, N. Y.
DETROIT, MICH.

PHILADELPHIA, PA.
CHICAGO, ILL.

PITTSBURGH, PA.
ST. PAUL, MINN.

BUFFALO, N. Y.
DENVER, COLO.

CLEVELAND, OHIO
KANSAS CITY, MO.

Products

MURPHY AUTOMATIC FURNACE and the RILEY SELF-DUMPING UNDERFEED STOKER.

General

Size of boilers, fuel, load conditions and other local factors determine the type of stoker. One type will not meet all conditions, but in the Riley underfeed stoker and Murphy Automatic Furnace there is a choice that will meet practically any condition.

For the plant with large boiler units or *with smaller units that are to be forced above rating* or where reserve capacity is essential, the Riley underfeed stoker meets the conditions.

For the plant with smaller boiler units or *with medium size boilers carrying a steady load*, the Murphy automatic furnace is well suited.

Murphy Automatic Furnace

Description—The correctness of the principle of construction of the Murphy automatic furnace has been demonstrated by 43 years of stoker experience. Improvements from time to time have increased its efficiency and durability. With its use, complete combustion prevents smoke and insures high CO₂ results. All ash and refuse are removed automatically, giving a clean fire and high efficiency at all times. Does away with necessity for opening furnace doors, thereby eliminating admission of cold air; coal supply to furnace is under absolute control and automatic regulation; it is a natural draft furnace and requires no fan or blower.

Adaptability—Designed for any type of boiler and units from 50 h.p. up to the larger units for which multiple retort underfeed stoker is best suited. Exceedingly flexible and efficiently handles variable loads and overloads up to 200% of boiler rating with minimum attention and without forced draft.

Maintenance—Maintenance cost averages about 10c per horsepower per year. Magazines and fronts are protected by fire brick; coking plates by air passing

under them; and clinker grinder, grate bearer and grates by exhaust steam and air, thus protecting all working parts.

Installations—Over 6000 boilers in all sections of the country are fired by Murphy furnaces. They are being used in practically every line of industry.

Catalogue—Send for Catalogue MS.

Riley Underfeed Stoker

Construction—Made up of standardized retort units. Its unique feature is reciprocating retort sides which keep fuel bed active and even. Coal feed and air supply are automatically controlled to meet load demands. Dumping of refuse is continuous and automatic. A safety connecting rod for each plunger prevents damage to stoker if plunger is blocked.

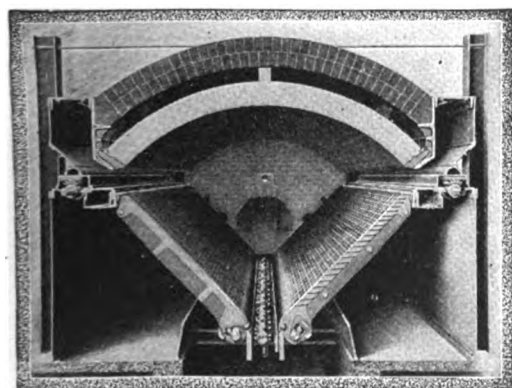
Flexibility—Moving grates break up banked fire and instantly admit air, giving rapid combustion. Riley stokers will raise a boiler from banked fire to 250% of rating in 5 minutes.

Capacity—Boiler capacity obtainable depends on number of retorts installed. With boilers fired from one end, 300% and 350% of rating are obtained during peaks. Where boilers are fired by two stokers set back to back, 500% and 600% of rating are possible.

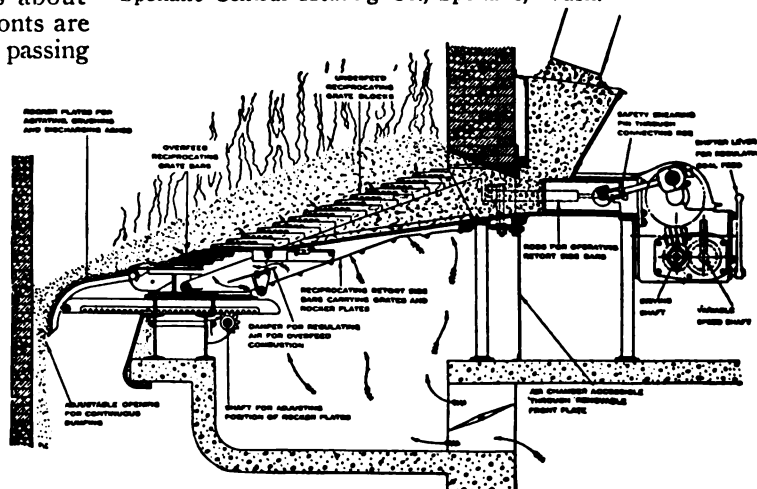
Catalogue—Send for Catalogue RS.

Installations—

Norton Company, Worcester, Mass.
Hartford Electric Light Co., Hartford, Conn.
New York Central Railroad Co., Port Morris, N. Y.
Buffalo General Electric Co., Buffalo, N. Y.
Public Service Electric Co., Newark & Burlington, N. J.
Goodyear Tire & Rubber Co., Akron, Ohio.
B. F. Goodrich Co., Akron, Ohio.
Columbus Railway, Power & Light Co., Columbus, Ohio.
Steel & Tube Company of America, Ironwood and Bessemer, Mich.
Pillsbury Flour Mills, Minneapolis, Minn.
City of Chicago Pumping Station, Chicago, Ill.
Union Electric Light and Power Co., St. Louis, Mo.
Memphis Gas and Electric Co., Memphis, Tenn.
Spokane Central Heating Co., Spokane, Wash.



MURPHY AUTOMATIC STOKER
Rear view



SECTIONAL VIEW OF RILEY STOKER SHOWING OPERATION

THE UNDER-FEED STOKER COMPANY OF AMERICA

Book Building
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PHILADELPHIA, PA.
PITTSBURGH, PA.

THE UNDER-FEED STOKER COMPANY OF CANADA, LTD.

TORONTO, 81 Victoria Street

Product

Manufacturers of JONES UNDER-FEED STOKERS.

Types of Jones Under-feed Stokers

Jones Under-feed Stokers are made in three types as illustrated and described below, namely: Jones "A-C" (automatic-cleaning) Stoker; Jones "Standard" Side-dump Stoker; Jones "Standard" Stoker.

Description and Operation

The design of all Jones Stokers is characterized by extreme simplicity. The stoker consists of one or more self-contained retorts equipped with a steam cylinder driving a ram, the successive strokes of which supply the fuel to the retort. The method of feeding the coal is easily understood by referring to the longitudinal views.

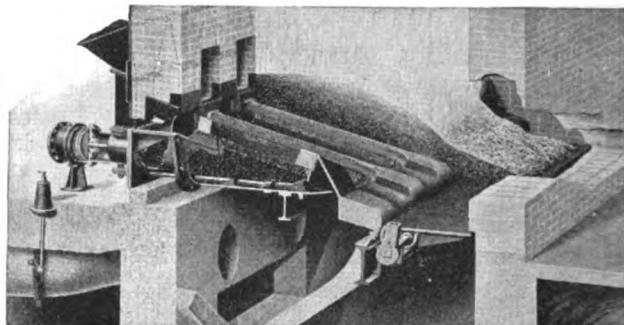
A fundamental advantage, shared by all Jones Stokers, is the underfeed principle of burning coal. The air is supplied along the top of the retort through tuyeres. Thus combustion takes place above the incoming green fuel, so that the heat drives off the volatiles from the fresh coal beneath. These volatiles, rising through the incandescent zone, are fully burned and the coal becomes coked before it rises to the combustion zone. The result is a highly efficient, economical and smokeless fire.

Note that there is but one moving part to each stoker or retort—none in the fire. This unequalled simplicity minimizes maintenance.

Fuel and air are automatically fed in the correct ratio to give highest efficiency at the combustion rate necessary to supply the required steam demand. When the steam demand increases, the supply of fuel and air is automatically increased, and this action is reversed when the demand falls. This insures an even steam pressure regardless of load fluctuations. Besides these advantages, which identify all Jones Stokers, the different types have the additional merits described individually.

Jones "A-C" (Automatic-cleaning) Stoker

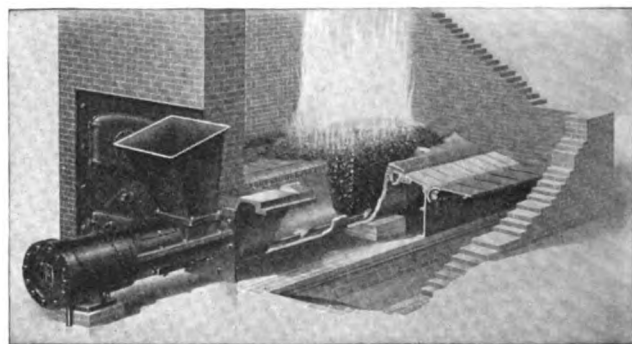
The Jones "A-C" (automatic-cleaning) Stoker (illustrated above) is a high capacity, high duty, automatically cleaned stoker for extreme service demands, high peak loads (300% of boiler rating easily carried) and continuous overloads. Illustration shows a four-retort stoker. Retorts are long and of large capacity, insuring thorough volatilization and ample coal reserve for peak loads. Construction of retorts prevents avalanching and holes in fire. Side wall clinkers are prevented by high, air-cooled side tuyeres. One man, hand operated dump eliminates complicated power dumping mechanism. A special catalogue, completely describing the "A-C" Stoker, will be sent upon request.



THE JONES "A-C" STOKER

Jones "Standard" Side Dump Stoker

A simple, inexpensive, economically operated and self-cleaning stoker requiring little excavation, for any type of boiler. Widely used for generation of steam and for industrial heating such as annealing, melting, welding and forging furnaces, drying kilns, etc. Ask for the special bulletin describing this stoker.



THE JONES "STANDARD" SIDE DUMP STOKER

Jones "Standard" Stoker

An inexpensive and economical self-cleaning stoker of high boiler capacity and adaptable to all types of boilers and many industrial heating operations. Giving excellent service in hundreds of plants. Write for the "Standard" catalogue.



THE JONES "STANDARD" STOKER

THE VULCAN SOOT CLEANER CO.

DUBOIS, PA.

Products

SOOT CLEANERS for all types of water tube and return tubular boilers, superheaters and economizers.

Vulcan Soot Cleaners

Vulcan soot cleaners are built for removing the soot from all types of return tubular and water tube boilers, superheaters and economizers. They remove soot that it is impossible to reach by hand and reduce the time required for hand cleaning about 90%.

The Vulcan soot cleaner consists of a series of elements equipped with nozzles so arranged as to discharge steam at high velocity against all parts of the heating surface, thereby removing all soot and ashes from the tubes.

The loss in capacity, the increased fuel consumption, and the increased operating expense of a boiler plant in which the soot is allowed to accumulate on the heating surface is too well known to require an extensive discussion here. Suffice to say that Vulcan soot cleaners will effect a saving of from 4% to 8% in coal consumption and materially increase boiler capacity. Vulcan cleaners should pay returns of at least 100% on first cost.

Application to Water Tube Boilers

Each type of water tube boiler has its own particular design of Vulcan soot cleaner. The element containing the steam nozzles is designed to rotate by means of a sheave wheel and chain, so that all portions of the heating surface receive a thorough cleaning.

The illustrations on this page show the application of Vulcan soot cleaners to Stirling and B. & W. boilers and are typical of the arrangement for all water tube boilers of the vertical and horizontal types.

In connection with the Stirling boiler it will be noted that the nozzles are so arranged that steam is discharged between the different rows of tubes, and

parallel to baffles and mud drum, so that every part of the boiler is thoroughly cleaned.

The B. & W. and all other staggered tube boilers are cleaned by the famous Vulcan diagonal method; that is, the jets of steam are directed down the clear diagonal spaces formed by the staggering of the tubes, and therefore do not strike directly against them. This method produces a scrubbing effect which effectively removes all soot.

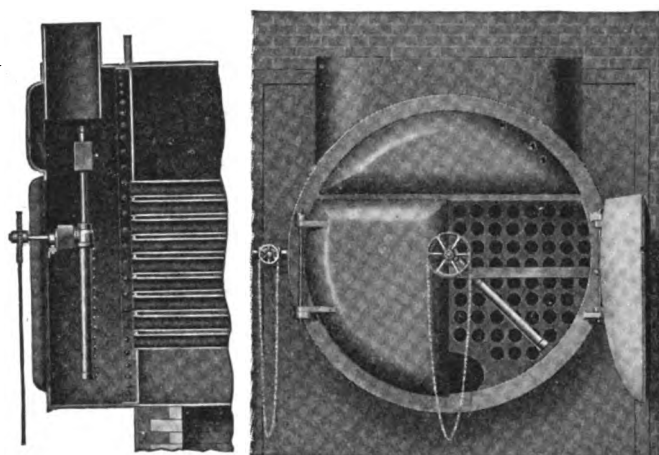
Application to Return Tubular Boilers

The Vulcan soot cleaner is built for connection to either the front or rear end of these boilers.

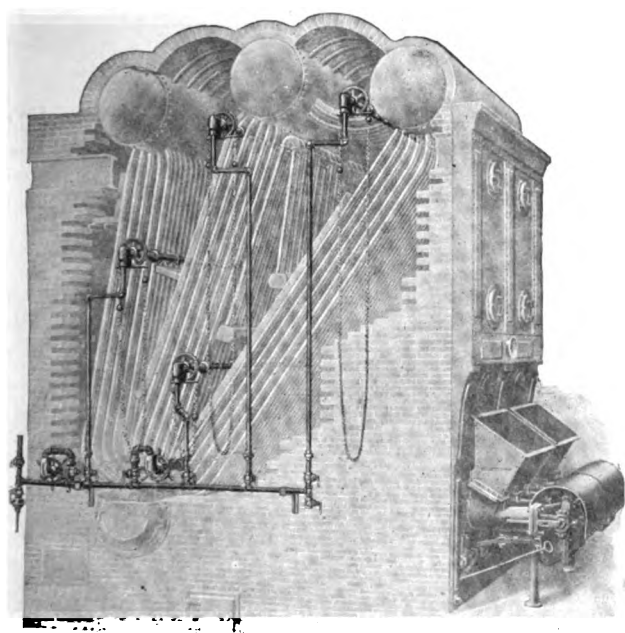
The illustration shows the application of the Vulcan soot cleaner to the front end of a return tubular boiler.

The cleaner in this case consists of a revolving blow arm equipped with De Laval type nozzles, so spaced as to blow directly into each tube as the arm is rotated.

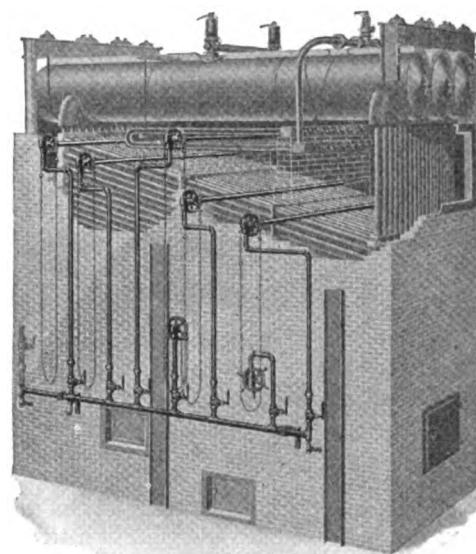
The blow arm is operated in the front end of the boiler by means of a chain and sprocket which does not interfere with opening the smoke box doors, while the rear end cleaner is operated by a handle from outside the setting.



VULCAN SOOT CLEANER APPLIED TO FRONT END OF RETURN TUBULAR BOILER



VULCAN SOOT CLEANER APPLIED TO STIRLING BOILER



VULCAN SOOT CLEANER APPLIED TO B. & W. BOILER

POWER SPECIALTY COMPANY

Manufacturers of Superheaters

111 Broadway
NEW YORK, N. Y.

BRANCH OFFICES

BOSTON, MASS., 50 Congress Street
PHILADELPHIA, PA., Land Title Building
DALLAS, TEX., Linz Building

CHICAGO, ILL., Harris Trust Building
KANSAS CITY, MO., Reliance Building
LONDON, ENG., 315 Oxford Street, W 1

PITTSBURGH, PA., Oliver Building
SAN FRANCISCO, CAL., Balboa Building

AGENCIES

SEATTLE, WASH., J. D. HULL, Coleman Building OTTAWA, CAN., GENERAL SUPPLY CO. OF CANADA, LTD.

Products

FOSTER SUPERHEATERS for stationary and marine water tube and fire tube boilers, for locomotives and for industrial processes.

FOSTER FUEL ECONOMIZERS.

FOSTER STILLS and OIL HEATERS.

Advantages of Using Superheat

The use of superheated steam saves fuel and improves plant efficiency as follows:

- (1) Eliminates condensation losses in pipe lines and engine cylinders.
- (2) Increases steam turbine efficiency at least 10%.
- (3) Better operating conditions and lowers maintenance expense by eliminating cylinder friction and wear caused by the presence of water.
- (4) Simplifies cylinder lubrication as the oil is not washed off the contact surfaces.
- (5) Saves in piping costs, as smaller piping can be used.
- (6) Gives a substantial power increase without increasing the number of boilers or permits equal power to be maintained at lower steam pressure.
- (7) Gives high temperature at low pressure for special manufacturing purposes.

(8) The steam saving effected by 100° of superheat is:

- 10% to 14% for turbines
- 10% to 12% for triple expansion engines
- 14% to 16% for compound engines
- 18% to 22% for simple engines
- 20% to 30% for direct acting pumps

The fuel savings, from 6% to 20%, are sufficient to pay for the superheater in a short time.

Types of Foster Superheaters

Attached Type—Fits within the boiler and adds up to 250° of superheat (Fig. 1).

Separately Fired Type—For any kind of fuel and superheating up to 1200° total temperature.

Portable Type—For experimental and temporary use (Fig. 5).

Typical Construction of Foster Superheaters

The Foster superheater consists of a series of U-tube elements set parallel to each other and having ends expanded into steel manifolds which run the full width of the boiler. Saturated steam from the boiler goes into one of these manifolds, through the U-tubes and out the other.

The steel tubes of the elements (Fig. 3) are covered with cast iron rings and with a split cast sleeve over

the U-bend. The tube ends are expanded into reamed holes in the headers, and opposite each other is a hand-hole fitted with steel plug and metallic gasket, for free access to every part of the interior. A cylindrical core within each tube compels all steam to travel close to the tube surface, where it can absorb heat quickest.

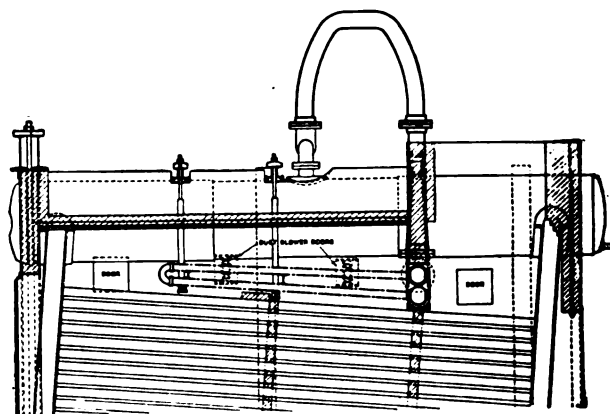


FIG. 1. TYPICAL INSTALLATION OF ATTACHED TYPE FOSTER SUPERHEATER

Superheater is located between drums and top row tubes where exposed to hot gases from first boiler pass

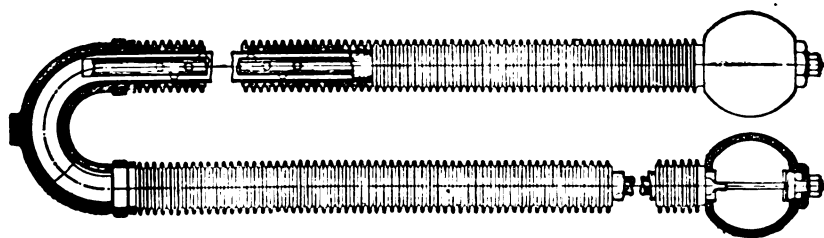


FIG. 2. TYPICAL FOSTER RETURN BEND ELEMENT AND CONNECTING HEADERS

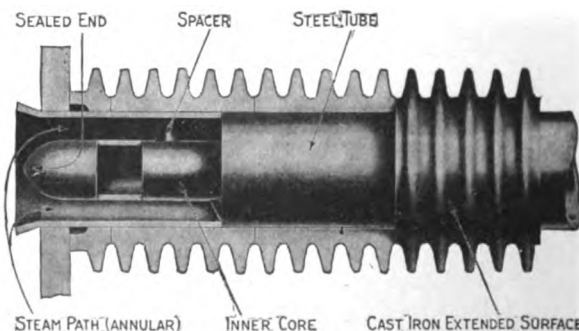


FIG. 3. TYPICAL FOSTER HEATING SURFACE

Steel tube for strength, cast iron exterior protection for durability. Extended surface affords better facilities for heat absorption from furnace gases, and extra metal in cast iron protection forms a reservoir for heat storage and temperature regulation

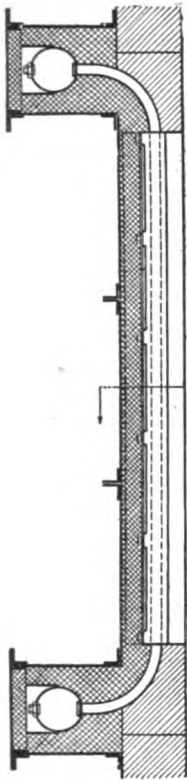


FIG. 4. TYPICAL FOSTER R-H-A ELEMENT INSTALLED IN BOILER FURNACE WALL

is flattened, and shadow tile may be placed between the elements to reduce the absorption of heat.

The advantages of this construction are:

- (1) Ability to obtain high superheat without change in construction of boiler proper, so as to obtain necessary space required.
- (2) No obstruction to draft through boiler.
- (3) Maximum superheat throughout range of normal ratings; no temperature rise during peak load.
- (4) Every part of superheater easily accessible for cleaning and repairs.
- (5) Minimum loss of pressure through superheater.

Foster Superheater with R-H-A Elements for Utilizing Radiated Furnace Heat

Development in furnace and improved combustion of fuel have greatly changed the distribution of heat over boiler heating surfaces in the modern power station. This, combined with the use of higher steam pressures and temperatures, has called for improvement in superheater design to meet these conditions.

Foster R-H-A (radiant heat absorbing) superheater placed in the wall of the combustion chamber offers a construction already tested in service and well suited to meet the above conditions.

The superheater consists of elements formed of cold drawn seamless tubing expanded into steel inlet and outlet manifolds. The outside surface of the elements is covered with a series of heavy cast iron rings snugly fitted to the steel tube. The surface of the ring presented to the furnace for the absorption of radiant heat

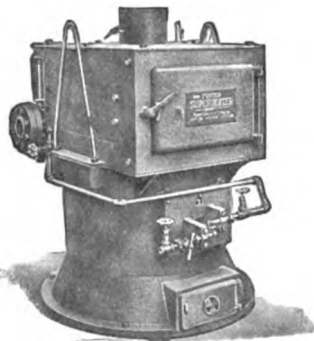
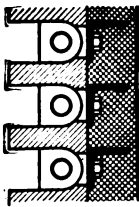


FIG. 5. SMALL PORTABLE FOSTER SUPERHEATER

For special purposes or field work, such as heating air for drilling, hoisting or general contractor's work.

(6) Superheater replaces one of the brick furnace walls with a permanent construction, thus reducing furnace brickwork.

Foster Fuel Economizer

This apparatus abstracts heat from the flue gases and utilizes it in preheating boiler feed water.

Typical Foster heating surface (shown in Fig. 3) is used, and as all parts under pressure are of steel, this economizer is ideal for high pressure plants where all-cast-iron heating surface could not be satisfactory. External cast-iron rings prevent corrosion of the tubes from the furnace gases. The cast-iron rings also greatly increase the amount of outside heating surface per

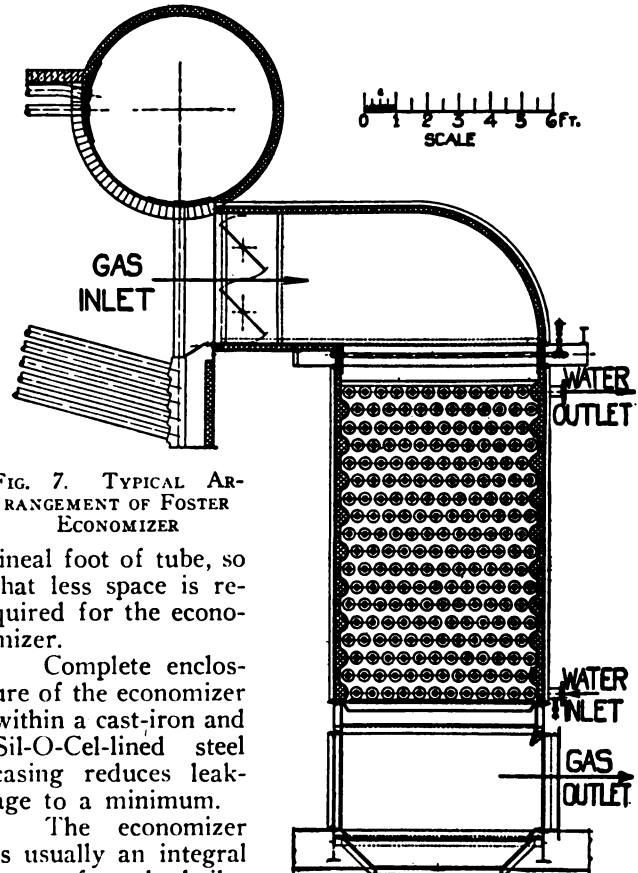


FIG. 7. TYPICAL ARRANGEMENT OF FOSTER ECONOMIZER

lineal foot of tube, so that less space is required for the economizer.

Complete enclosure of the economizer within a cast-iron and Sil-O-Cel-lined steel casing reduces leakage to a minimum.

The economizer is usually an integral part of each boiler unit, so there are none of the radiation losses that must exist where the gases from each boiler must be conducted to a single large economizer.

Foster Oil Stills and Heaters

The Foster oil heater assures thorough combustion of fuel, dependable control of furnace temperature, uniform distribution of heat over all parts of the heating surface, ample heating surface for given requirements, positive circulation of oil at the proper rate, and easy cleaning of inside and outside of heating surface.

Special catalogue describes the construction and application of this apparatus.

Engineering Services and Literature

Twenty years' experience in heat engineering enables our engineers to give dependable advice and work out correct design of Foster apparatus to exactly meet existing conditions.

Where desired, we supervise erection and deliver the completed installation ready for service.

Literature will be mailed free if we are given an outline of the conditions to be met.

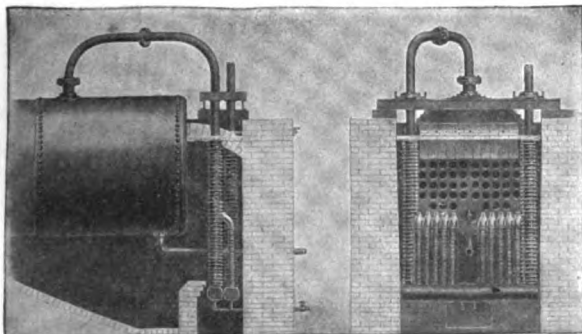


FIG. 6. FOSTER SUPERHEATER IN HORIZONTAL RETURN TUBULAR BOILER

FOUNDED 1867

THE GRISCOM-RUSSELL CO.

Manufacturers of Power Plant and Marine Auxiliaries

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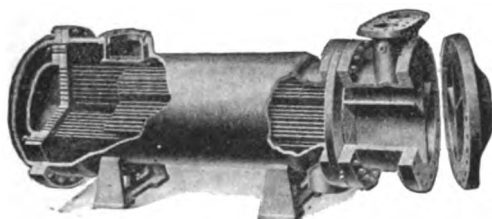
Products

INSTANTANEOUS and STORAGE WATER HEATERS; FEED WATER HEATERS; EVAPORATORS for Boiler Feed Makeup; OIL COOLERS; SUBCOOLING CONDENSERS; OIL HEATERS; OIL and WATER STRAINERS; FEED WATER FILTERS; STEAM, OIL and AIR SEPARATORS.

Also manufacturers of Grease Extractors.

G-R Instantaneous Heater

For heating boiler feed water or for supplying hot water for general service. Steam is the heating medium. Shell of cast iron; heating surface of straight seamless



G-R INSTANTANEOUS HEATER

drawn brass tubing. Floating head construction permits expansion and contraction of tubes without strain on tube joints.

Russell Storage Heater

To supply hot water in hotels, apartment houses, laundries, dye houses, etc. Water in shell; steam in

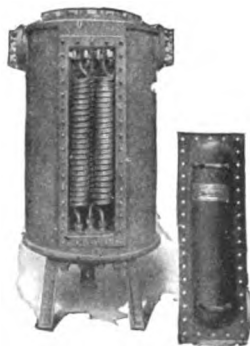


RUSSELL STORAGE HEATER

tubes. A storage capacity of hot water is assured at all times. Shell is of steel and heating surface of seamless drawn brass tubing.

Reilly Heater

A closed type heater for either marine or stationary power plants for boiler feed or other purposes. Steam is the heating medium. Shell of cast iron; heating surface seamless drawn copper tubing. Built in any required size.



REILLY HEATER

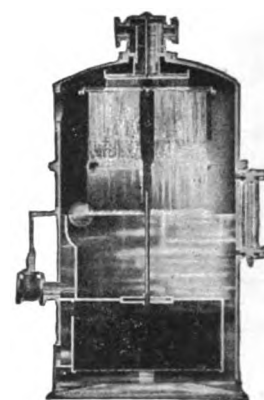


Massillon Open Heater

For the purification and heating of boiler feed water by direct contact of steam with water.

Shell and trays are of cast iron.

A Stratton Jr. Oil Separator can be supplied if required, for the removal of oil from exhaust steam before it enters heater.

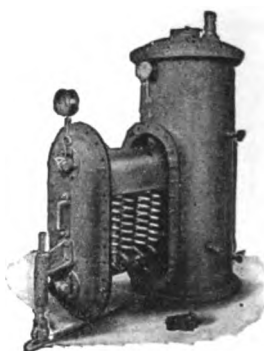


MASSILLON OPEN HEATER

Reilly Evaporator, Self-Scaling

The up-to-date method of purifying boiler feed water is by the use of Reilly Evaporators, Self-Scaling.

This system provides absolutely pure water, eliminates all scale and boiler blowdown, decreases maintenance and repairs, permits operation at heavy overloads, reduces the coal and labor costs, and pays for itself in from 12 to 18 months operating time.



REILLY EVAPORATOR, SELF-SCALING

Multiwhirl Cooler

For cooling lubricating oil used in turbine bearings, reduction gears, etc., and for quenching oils used in heat treatment of steel.

Practically standard in the United States Navy and merchant marine.



MULTIWHIRL COOLER

Over 1600 in daily operation throughout the world. The particular feature is the patented helical baffle which directs oil in its passage through cooler without causing appreciable pressure loss.

Multiwhirl Subcooling Condenser

For the condensing and subcooling of gasoline, kerosene, or any other vapors used in oil refinery work. Vapors enter tubes at top and are condensed and cooled in their passage through the tubes, distillate being taken off at the bottom. Condensing and cooling water enters shell at bottom and travels upward through the helical path and leaves condenser at top.

Has many distinct advantages not possessed by any other condenser now used in the oil refining field.

Excellent adapted to gasoline recovery plants for the efficient condensation of gasoline vapors and for condensing various vapors in solvent recovery systems.

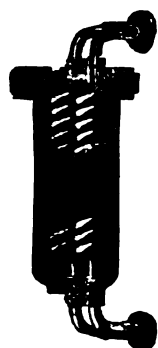


MULTIWHIRL
SUBCOOLING
CONDENSER

Reilly Oil Heater

For the preheating of fuel oil before it is fed to the burners of boilers, furnaces or cupolas. Oil passes through coils of seamless drawn steel tubing, and high pressure steam is supplied to shell. Steam condensation is usually returned to boilers.

Construction of the Reilly Oil Heater prevents any contamination of condensed steam by oil, as all oil joints are outside of steam space.



REILLY OIL
HEATER

G-R Oil Heater

Another design of heater for preheating fuel oil.

Shell is of wrought steel with cast iron heads; tube plates are of steel plate and tubes are of seamless drawn steel expanded into tube sheets.

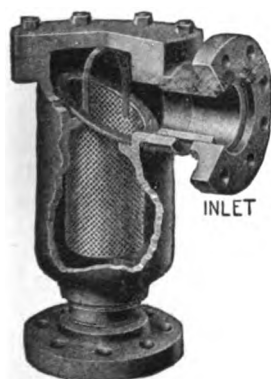


G-R OIL
HEATER

G-R Strainer

For removal of foreign matter in suspension from suction and discharge lines of lubricating or fuel oil systems. Also for removal of sticks, weeds, etc., from river water. Made in sizes 1 to 6 in. inclusive.

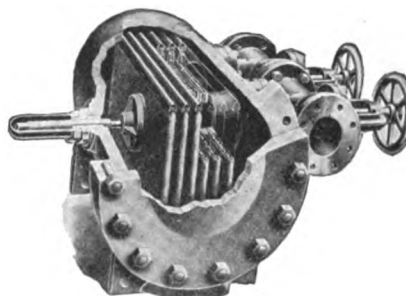
Can be arranged in pairs, so that one strainer can be cleaned while the other remains in service.



G-R STRAINER

G-R Multiscreen Filter

Designed for the removal of oil from returned condensed steam from engines, heating systems, etc. Protects boiler against damage due to oil in feed water.



G-R MULTISCREEN FILTER

New Stratton Separator

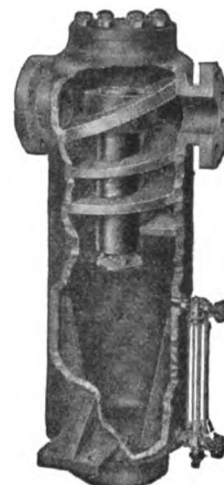
The New Stratton Separator is a re-design of the famous Stratton Separator, thousands of which are in use throughout the world.

Effectively removes water from steam before it enters engine or turbine.

Effectively removes water from compressed air before it enters air tools, sand blast machines, etc.

Built of either cast iron or cast steel, depending on the service.

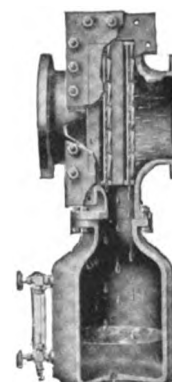
Made in various types of inlet and outlet to suit pipe connections.



NEW STRATTON
SEPARATOR

Bundy Oil Separator

For the effective removal of oil from exhaust steam to prevent contamination of heating systems or boilers. Removable multiple baffle plate construction permits easy cleaning.



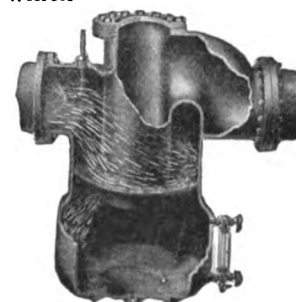
BUNDY OIL
SEPARATOR

Stratton Jr. Oil Separator

For removal of oil from exhaust steam. A water spray at the inlet condenses any vaporized oil.

The steam and condensed oil pass through a helical path which causes a swirling motion of the entire mass. The heavier oil is thrown out of the steam current and the dry steam rises up through center pipe and out into steam line.

Built of cast iron. Made in various types of inlet and outlet to suit pipe connections.



STRATTON JR. OIL
SEPARATOR

ROSS HEATER & MFG. CO., INC.

1407-1411 West Avenue
BUFFALO, N. Y.

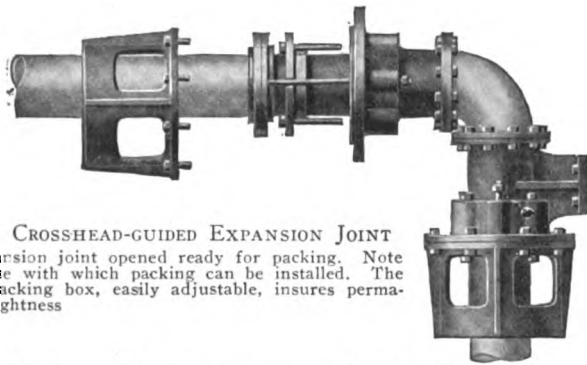
Products

Ross Products include:

BOILER FEED WATER HEATERS.
HOT WATER SERVICE HEATERS.
HOT WATER HEATING SYSTEM HEATERS.
OIL HEATERS.
CHEMICAL HEATERS.
SUGAR JUICE HEATERS.
STORAGE HEATERS.
SURFACE CONDENSERS.
BAROMETRIC CONDENSERS.
LOW HEAD JET CONDENSERS.
DISTILLING CONDENSERS.
VACUUM PUMPS.
CROSSHEAD-GUIDED EXPANSION JOINTS.
Oil Coolers.
Water Coolers.
Heat Exchangers.
Strainers.
Bryant Radiator Machines.

The Ross Crosshead-guided Expansion Joint

Relieves pipe of all strains due to expansion or contraction. Made in all pipe sizes for traverse of

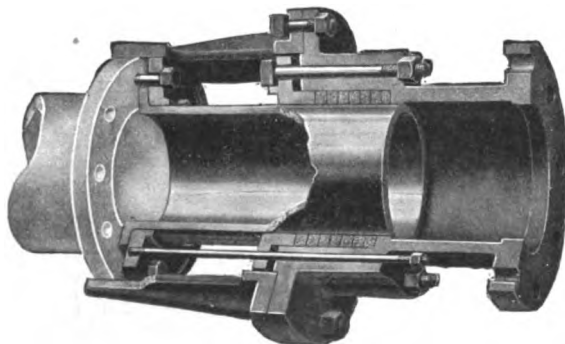


Ross CROSSHEAD-GUIDED EXPANSION JOINT

Expansion joint opened ready for packing. Note the ease with which packing can be installed. The deep packing box, easily adjustable, insures permanent tightness.

4 to 16 in., with or without anchor in the following types: low pressure cast iron for 125 lbs. steam, water, air or gas; high pressure cast iron for 250 lbs. saturated steam, water, air or gas; high pressure cast steel for 300 lbs. steam and 350° Fahr. superheat.

Oil fittings for temperature of 1000° Fahr.
Write for special Catalogue.

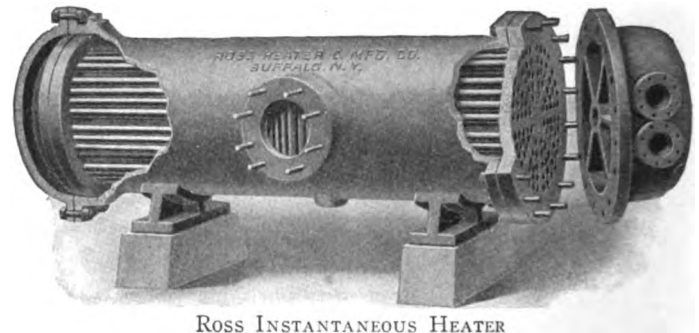


SECTIONAL VIEW, SINGLE EXPANSION JOINT

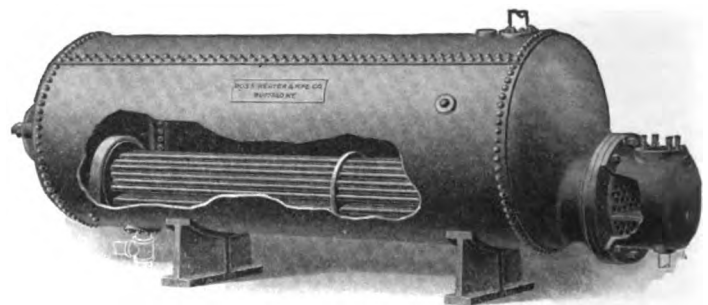
Ross Heaters

Instantaneous and storage type heaters for water, oil, sugar juice, chemicals, etc.

SWEET'S CATALOGUE



ROSS INSTANTANEOUS HEATER



ROSS STORAGE TYPE HEATER, LARGE STORAGE CAPACITY FOR SUDDEN DEMANDS

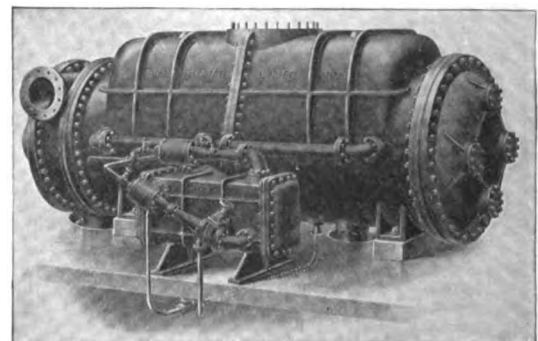
Heaters for all services and in any size.
Send for special Catalogue on this subject.

Ross Surface Condensers

Ross surface condensers, barometric condensers and low head jet condensers can be supplied in any size. They will produce the highest vacuum that the temperature of the condensing water will permit. In the manufacture of Ross condensers, the same care, good materials and liberal ratings are used as in all other Ross products.

The Airjector pump for removing the air and non-condensable vapors from condensers is shown in the illustration below. It is of the steam jet type in which two steam ejectors operate in series and with an interposed condenser-cooler. The highest possible vacuum is produced and its simplicity reduces the maintenance and operating costs to a minimum.

Write us if you are having air pump troubles.



ROSS SURFACE CONDENSER WITH AIRJECTOR PUMP

STEWART HEATER CO.

KING CONSTRUCTION CO., SUCCESSORS

Feed Water and Storage Tank Heaters

Box 124
NORTH TONAWANDA, N. Y.

Products

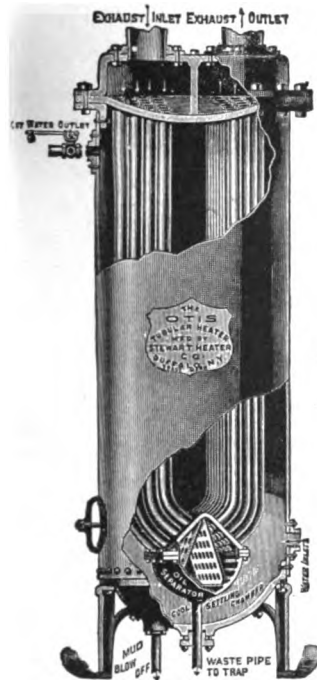
"OTIS" FEED or INSTANTANEOUS SERVICE WATER HEATERS and PURIFIERS, open and closed; STORAGE TANK HEATERS for laundries, hotels, asylums and other institutions.

Also manufacturers of Power Pumps.

General Description

The "Otis" heater has been made for over forty years and its principle is well known among engineers, theoretical and practical. Its salient features are:

Ease in cleaning, more so than any other tubular heater on the market; will heat to 210° Fahr.—and at that temperature will cause impurities to precipitate; it will extract the oil from the engines; carry off condensation of the exhaust; each tube can expand and contract independently of the others; it has a cool settling chamber; the water goes in at the bottom and comes out at the hottest part, the top.



"OTIS" FEED or INSTANTANEOUS WATER HEATER

Details of Construction

The body of the "Otis" feed or instantaneous water heater is made of riveted steel boiler plate, the top end of which is riveted to a heavy cast iron ring with a projecting rim cast on its outer surface, forming a flange. To this flange the tube sheet and top dividing plate are attached by a row of bolts. The lower end of the shell is riveted to a cast iron conical bottom, which is supported by four legs.

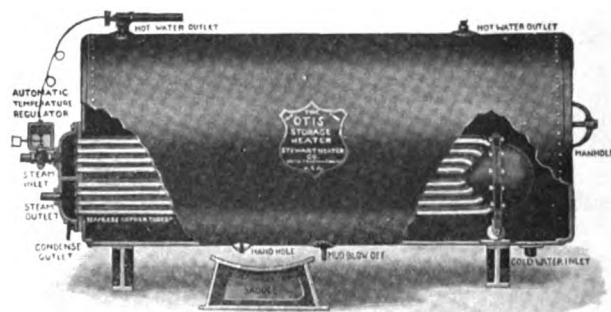
The tubes are all of plain seamless drawn copper, with no corrugations to catch the scale, 1 1/4 in. diameter. No. 16 Stubs' gauge. The

number and length of the tubes determine the square feet of heating surface in each particular size.

The tube sheet, tubes and water catcher are suspended from the top flange and are free to move with the expansion and contraction.

The "Otis" storage tank heater is constructed along the same lines as the feed water heater and can be furnished with any heating capacity per hour and any storage capacity desired.

Both types of heaters can be adapted for exhaust steam, live steam, or combination of live and exhaust.



"OTIS" STORAGE TANK HEATER

Size No.	Diameter of shell	Length of shell	Water inlet and outlet, in.	If exhaust steam is used, inlet and outlet, in.	Live steam to silent mixer, in.	Mud blow off, in.	Storage capacity, gals.	Heating capacity, gals. per hour	Approximate shipping weight, lbs.
1	2 1/2	60	1 1/4	3	1	2	120	480	775
2	2 1/2	72	1 1/4	3	1	2	145	580	850
3	2 1/2	84	1 1/4	3	1	2	170	680	960
4	3	60	1 1/2	4	1	2 1/2	180	720	1100
5	3	72	1 1/2	4	1	2 1/2	215	860	1200
6	3	84	1 1/2	4	1	2 1/2	250	1000	1300
7	3	96	2	4	1	2 1/2	300	1200	1425
8	3 1/2	72	2	5	1 1/2	3	325	1300	1740
9	3 1/2	84	2	5	1 1/2	3	365	1460	1850
10	3 1/2	96	2	5	1 1/2	3	420	1680	1960
11	4	96	3	5	1 1/2	3	575	2300	2680
12	4	120	3	5	1 1/2	3	720	2800	2900
13	4 1/2	120	3	6	1 1/2	3	940	3760	3700
14	4 1/2	198	3	6	1 1/2	3	1500	6000	4800

Tested and guaranteed for 100 lbs. water and steam pressure. Above capacities are based on using exhaust or low pressure steam and heating water from a temperature of 50° to 180° F. If exhaust steam is to be used send us size of exhaust pipe. When live steam is used, capacity is largely increased, in proportion to steam pressure carried.

DIMENSIONS, "OTIS" TUBULAR FEED WATER HEATERS, OIL SEPARATORS AND PURIFIERS

No. of heater or size of exhaust	Horse power	Sq. ft. heating surface	Tubes, number	Diameter shell, in.	Total height, in.	Shipping weight, lbs.	No. of heater or size of exhaust	Horse power	Sq. ft. heating surface	Tubes, number	Diameter shell, in.	Total height, in.	Shipping weight, lbs.
K 4	50	17	26	15	48	641	K 10	1240	413	180	35	120	4923
KA 4	75	25	26	15	60	709	KA 10	1400	472	180	35	132	5221
KB 4	100	34	26	15	72	781	KB 10	1590	531	180	35	144	5510
KC 4	130	43	26	15	84	855							
K 6	190	64	56	20	72	1306	K 12	1700	580	236	40	132	7870
KA 6	235	79	56	20	84	1413	KA 12	1950	650	236	40	144	8240
KB 6	300	101	56	20	96	1542	KB 12	2175	725	236	40	156	8611
K 7	350	117	102	25	72	2109	K 14	2550	850	282	45	144	10272
KA 7	450	151	102	25	84	2321	KA 14	2850	950	282	45	156	10748
K 8	550	184	102	25	96	2472	KB 14	3150	1050	282	45	168	11234
KA 8	650	217	102	25	108	2678							
K 9	820	274	150	30	108	3492	K 18	3650	1216	327	54	144	16292
KA 9	950	316	150	30	120	3764	KA 18	4150	1383	327	54	156	17482
							KB 18	4650	1550	327	54	168	18240
							KC 18	5150	1716	327	54	180	19000
							KD-18	5700	1900	327	54	192	19780

In ordering select heater at least the same capacity as the boiler horsepower. The best results can not be obtained if heater is too small. State whether horizontal or vertical heater is preferred; no extra charge for horizontal. Companion flanges for steam inlet and outlet are furnished without extra charge. Same can be threaded for any size up to and including size specified in list. Water connections furnished any size.

THE WHITLOCK COIL PIPE COMPANY

Manufacturers of Heat Exchange Apparatus, Feed Water Heaters, Service Water Heaters

HARTFORD, CONN.

NEW YORK OFFICE, Singer Building, 149 Broadway
SOUTHERN OFFICE, Charlotte, N. C.
BUFFALO OFFICE, Ellicott Square Building

CHICAGO OFFICE, Fisher Building, 343 S. Dearborn Street
PHILADELPHIA OFFICE, Commercial Trust Building
BOSTON OFFICE, 50 Congress Street

Products

AMERICAN STANDARD FEED WATER HEATERS; AMERICAN BERRYMAN FEED WATER HEATERS; WHITLOCK AMERICAN STRAIGHT TUBE FEED WATER HEATERS; WHITLOCK AMERICAN INSTANTANEOUS HEATERS for hot water service; WHITLOCK AMERICAN STORAGE HEATERS; WHITLOCK AMERICAN HOT WATER CONVERTORS; SPECIAL HEATERS and HEAT EXCHANGERS.

Also manufacturers of Pipe Bends; Flanged Piping and Headers for high pressure power plant piping; Coils and Bends of iron, steel, copper and brass pipe and tubing of all descriptions.

Feed Water Heaters

The necessity for, and the economy of, feed water heaters is so generally acknowledged that a discussion of this feature would be out of place here, and only the description of the distinctive features of the American standard feed water heater will be given.

Durability of Construction—The American standard feed water heater is particularly adapted to standing up under the severe service to which a closed feed water heater is subjected, when working under full boiler pressure and receiving the impact of each stroke of the feed pumps, by the following outstanding features:

(1) Seamless copper tubing, superior to brass, mechanically, in conductance of heat and in resistance to corrosion and electrolytic action.

(2) All joints brazed, eliminating possibility of leaks; there being no screwed or flanged joints subject to boiler pressure.

(3) Coils firmly held but allowed to expand and contract freely by means of steel braces and patented swiveling malleable iron clamps.

(4) The best of material is used throughout. Nothing but seamless copper tubing and the best grades of gray iron and tank steel enter into the construction of these heaters.

High Feed Temperature—Particular attention is called to the fact that all of the American standard feed water heaters are guaranteed to heat the rated amount of water (based on 30 lbs. per hour per boiler horsepower) to within 2° of the steam temperature, or to 210° when supplied



with sufficient steam at atmospheric pressure. This result is achieved by furnishing a liberal amount of heating surface per rated horsepower, designed and constructed so as to secure the maximum efficiency in heat transmission.

These heaters are therefore not to be considered as "competition" heaters and are not in the same class with the ordinary commercial closed feed heater, which does not heat the water to within less than 7° to 8°, and frequently not to within less than 12° to 13° of the steam temperature. This point is more fully discussed in Bulletin No. 13, a copy of which will be sent on request.

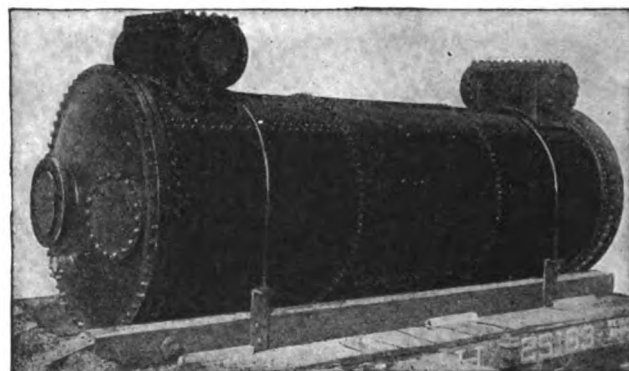


FIG. 204. TYPE "B" AMERICAN STANDARD FEED WATER HEATER, HORIZONTAL PATTERN

Hot Water Service Heaters

Under this heading are generally included all heaters for furnishing hot water for toilet service, bath, showers, manufacturing purposes, etc., in fact for every purpose except boiler feed. They may be broadly divided into two classes: instantaneous heaters and storage heaters.

Instantaneous Heaters—In this class the water is heated instantaneously as it passes through the heater, no hot water being held in storage. Used wherever the demand for hot water is fairly uniform or where the steam supply is large and flexible compared with the demand for hot water. They are frequently used in combination with storage tanks, the combination making, in effect, a storage heater.

There are 3 principal styles of this class: the copper coil, Type "AC" (Fig. 15A); the U-bend or Berry-



FIG. 15A. TYPE "AC" COPPER COIL HEATER

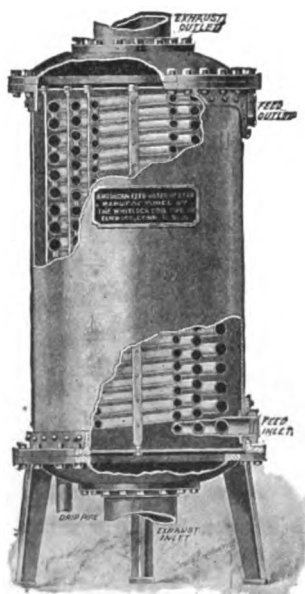


FIG. 18. TYPE "A" AMERICAN STANDARD FEED WATER HEATER

WHITLOCK AMERICAN TYPE "R" INSTANTANEOUS HEATERS

Size No.	2 Pass, Temp. Range 40° to 80° F.						4 Pass, Temp. Range 40° to 120° F.						Multi Pass, Temp. Range 40° to 180° F.					
	Capacity, gals. per hr.	Over-all length, in.	Diameter of shell, in.	Size of connections, in.		Weight lbs.	Capacity, gals. per hr.	Over-all length, in.	Diameter of shell, in.	Size of connections, in.		Weight lbs.	Capacity, gals. per hr.	Over-all length, in.	Diameter of shell, in.	Size of connections, in.		Wt. lbs.
				Water	Steam					Water	Steam					Water	Steam	
0	150	11½	7	¾	1¼	70	80	11½	7	¾	1	70	25	15½	7	¾	1	80
1	350	14½	7	1¼	1½	80	150	16½	7	1¼	1¼	85	60	26½	7	¾	1¼	110
2	650	19½	7	1½	1½	100	300	21½	7	1	1½	100	150	37½	7	¾	1½	140
3	1100	23½	7	2	2	110	480	26½	7	1	2	115	200	39½	7½	1	1½	225
4	1600	29½	7	2	2½	125	650	31½	7	1¼	2½	130	250	48½	9½	1	2	260
5	1900	34½	7	2	3	160	800	38½	7	1¼	2½	150	300	51½	9½	1	2	210
6	2550	24½	9½	2½	3	210	960	24½	9½	1½	3	190	400	40½	9½	1¼	2½	250
7	3200	30½	9½	2½	3½	240	1350	30½	9½	2	3	230	500	43½	9½	1¼	3	275
8	3800	35½	9½	2½	4	300	1600	35½	9½	2	3½	255	600	48½	9½	1¼	3	300
9	5100	43½	9½	3	4½	320	2100	43½	9½	2	4	300	800	51½	12	1¼	3½	510
10	6350	55½	9½	3	4½	380	2600	55½	9½	2½	4½	370	1000	60½	12	1½	3½	575
11	7950	44½	12	4	6	565	3300	51½	12	2½	5	555	1250	73½	12	1½	4	680
12	9550	51½	12	4	6	625	4000	60½	12	3	6	625	1500	59½	15	2	4½	710
13	12700	66½	12	4	7	760	5300	78½	12	3	6	775	2000	72½	15	2	5	825
14	15900	51½	15	5	8	810	6600	55½	15	3½	7	790	2500	59	17	2½	6	1010
15	19100	59½	15	5	8	900	8000	65½	15	4	8	885	3000	71	17	2½	6	1135
16	25600	59	17	6	10	1400	10500	71	17	4½	10	1250	4000	89	17	2½	7	1350
17	31700	71	17	6	10	1390	13300	83	17	5	10	1420	5000	74½	20	3	8	1695
18	38200	61½	20	8	12	1800	16000	72½	20	5	10	1800	6000	88½	20	3	9	1940
18½	44400	69½	20	8	12	1940	18500	82½	20	5	12	2000	7000	101½	20	3	9	2140
19	50700	78½	20	8	12	2100	21000	92½	20	6	12	2165	8000	64½	26	4½	10	2565
19½	57100	75½	26	10	14	2660	24000	60½	26	7	12	2625	9000	71½	26	4½	10	2745
20	63450	64½	26	10	14	2860	26700	67½	26	7	12	2820	10000	78½	26	4½	12	2980
21	79300	74½	26	10	16	3300	33300	82½	26	7	14	3285	12500	94½	26	4½	12	3440
22	95100	63	30	12	18	4250	40000	67	30	8	14	3960	15000	81	30	5	14	4000
23	126900	80	30	12	20	4980	53300	87	30	8	16	4600	20000	107	30	6	16	4785
24	158400	70	36	14	24	6550	66700	77	36	10	20	5980	25000	91	36	7	18	6150
25	191000	80	36	14	24	7060	80000	89	36	10	22	6820	30000	109	36	7	20	7065

Sizes 0 to 10 inclusive, have ¾ in. outside diameter No. 18 B. W. G. copper tubes.
Remainder have 1 in. outside diameter No. 17 B. W. G. copper tubes.

Sizes 0 to 10 inclusive, have ¾ in. outside diameter No. 18 B. W. G. copper tubes.
Remainder have 1 in. outside diameter No. 17 B. W. G. copper tubes.

Sizes 0 to 8 inclusive, have ¾ in. outside diameter No. 18 B. W. G. copper tubes.
Remainder have 1 in. outside diameter No. 17 B. W. G. copper tubes.

For other temperature ranges and for higher steam pressure than 0 lbs. gauge on which above capacities are based see Bulletin No. 27. Companion flanges are furnished for connections 3 in. and larger. Supporting cradles will be furnished only when specified.

man, Type "R" (Fig. 151); and the Straight Tube, Floating Head Type "S" (Fig. 152). The proper type to use in any given case depends, of course, on conditions; and advice and recommendations on this point will be gladly given.

The tables shown on this page give only the standard sizes of the more popular types of heaters. If types other than those shown are required, refer to the bulletins in General Catalogue.

Storage Heaters—In this class a large body of hot water is always held in storage to answer sudden demands; the heating of the water proceeds uniformly at all times whether hot water is being drawn or not. Used where the demand for hot water is intermittent and the steam supply is not flexible (as exhaust steam) or is limited in amount compared with the demand for hot water.

This company builds so many types of storage heaters that there is no room here for even a short description of the various designs; therefore only the most important, the Type "K," is shown.

Type "K" Service Heaters—These heaters are designed for use in hotels, office buildings, hospitals, laundries, factories, or wherever a large supply of hot water is required to provide for periods of heavy "peak" loads. The hot water builds up gradually between drafts, and is held in storage for sudden demands.



FIG. 151. TYPE "R" BERRYMAN HEATER

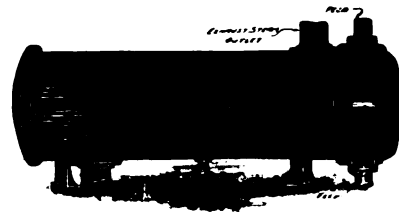


FIG. 152. TYPE "S" STRAIGHT TUBE FLOATING HEAD HEATER

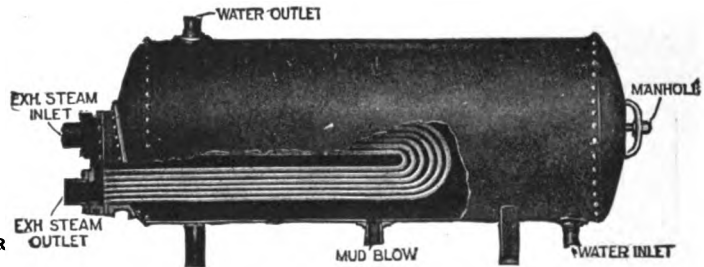


FIG. 14. TYPE "K" WHITLOCK SERVICE HEATER

WHITLOCK AMERICAN TYPE "K" STORAGE HEATER

Type K Shells To be used with Type K Heating Section. Shell prices include cradle. Manhole 11x15 in.						Type K Heating Sections Capacity based on heating from 40° to 180° with steam at 0 lbs. pressure.					
Size No.	Storage capacity, gals.	Diameter and length, in.	Thickness of shell, in.	Thickness of head, in.	Weight of shell, lbs.	Size No.	Capacity, gals. per hr.	Maximum size steam pipe, in.	Smallest shell into which section will fit, in.	Weight of entire heating section, lbs.	
1	65	18x 60	¼	¾	470	H 0	100	1½	18x60	80	
2	80	18x 72	¼	¾	520	H 1	150	1½	18x60	90	
3	118	24x 60	¼	¾	550	H 2	200	1½	18x72	130	
4	141	24x 72	¼	¾	715	H 3	250	2½	18x60	140	
5	164	24x 84	¼	¾	800	H 4	300	2½	18x72	145	
6	185	30x 60	¼	¾	800	H 5	350	2½	18x72	152	
7	220	30x 72	¼	¾	880	H 6	400	2½	24x84	159	
8	255	30x 84	¼	¾	980	H 7	500	3	18x60	235	
9	290	30x 96	¼	¾	1075	H 8	550	3	18x72	245	
10	365	36x 84	¼	¾	1460	H 9	600	3	24x84	272	
11	420	36x 96	¼	¾	1585	H 10	750	3	24x72	389	
12	475	36x108	¼	¾	1720	H 11	800	4	24x84	400	
13	525	36x120	¼	¾	1850	H 12	900	4	24x72	570	
14	575	42x 96	¼	¾	1890	H 13	1000	4	24x84	608	
15	720	42x120	¼	¾	2195	H 14	1250	5	30x96	650	
16	860	42x144	¼	¾	2520	H 15	1500	5	30x84	798	
17	1000	48x168	¼	¾	2840	H 16	1750	6			
18	950	48x120	¼	¾	2750	H 17	2000	6			
19	1140	48x144	¼	¾	3150	H 18					
20	1480	48x192	¼	¾	4050	H 19	2400	6	30x96	858	
21	1420	60x120	¼	¾	3720	H 20	2800	8	36x72	1417	
22	1660	60x144	¼	¾	4400	H 21					
23	2250	60x192	¼	¾	5000	H 22	3200	8	36x72	1478	
						H 23	3600	8	36x84	1550	

Directions for Use—Select the size storage required and combine its designating number with the number which designates desired hourly output. Assuming a required storage of 1000 gals. (No. 17 shell 42x168) and a required hourly output of 1740 gals. (No. H16 Heating unit) specify a Whitlock Type K, No. 17H16.

For other temperatures and steam pressures see Bulletin No. 27.

The features of construction are as follows:

(1) Heating surface placed low in the shell—surrounded by the coldest water—insuring maximum efficiency and full value of storage capacity.

(2) Individual tubes practically all the same length, preventing "short circuiting" of the steam and producing even distribution of steam.

(3) Tubes of U-bend construction, minimizing stresses due to expansion and contraction.

(4) Ends of tubes expanded and beaded over into a heavy rolled steel tube sheet, making a perfect joint.

(5) Heating section easily removable for inspection and cleaning.

(6) Heating surface of seamless copper tubing—the most reliable mechanically and the best conductor of heat. Far superior to brass.

Special Heaters

This company also designs and builds all kinds of special steam actuated heaters, such as oil heaters, air heaters, oil coolers, air coolers, evaporators, condensers, etc. Specifications and estimates on such apparatus will be submitted on request.

Installation Diagrams and Layouts

This company has developed a number of installation diagrams for piping layouts showing some of the more important types of installations in which Whitlock heaters are used, a few of which are shown on this page.

A complete set will be sent to architects or consulting engineers on request.

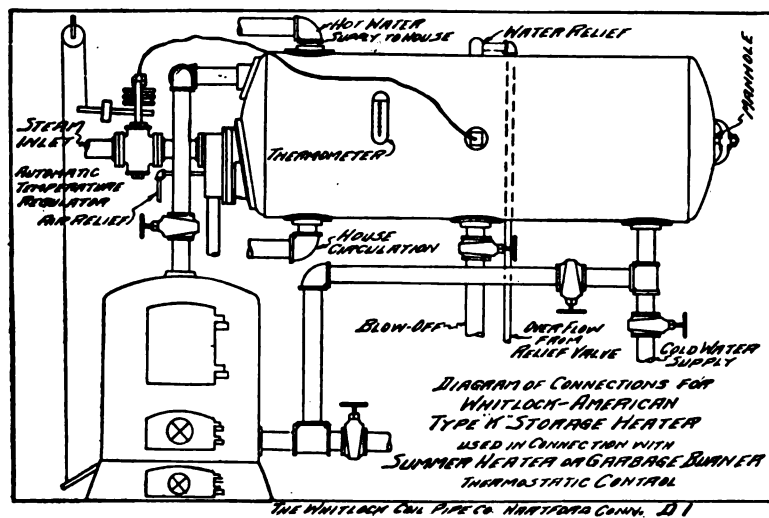


FIG. 160A. WHITLOCK AMERICAN TYPE "K" STORAGE HEATER WORKING IN CONNECTION WITH A COAL BURNING AUXILIARY HEATER

In this type of installation steam is supplied to the Type "K" heater from the main heating boilers during the heating season; and at times when no steam is carried on the main heating boilers, the auxiliary coal burning heater is fired.

This plan is also used in conjunction with garbage burner

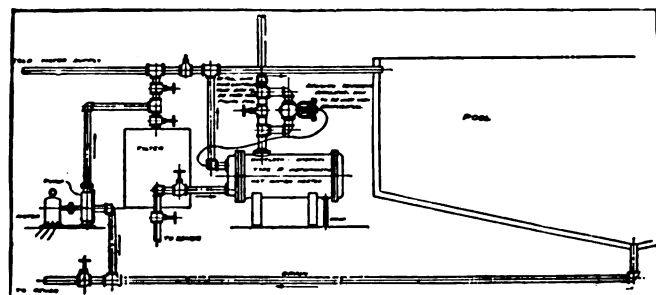


FIG. 207. WHITLOCK AMERICAN TYPE "R" INSTANTANEOUS HEATER CONNECTED TO HEAT A SWIMMING POOL BY THE RE-CIRCULATION METHOD

Typical Specification Forms

The following forms, if used by the specification writer, will insure against vagueness, and will cover in a brief, complete way the important points to be considered. Regular printed forms furnished by this company for use of engineers and architects on request.

Storage Service Heater—It shall be — inside diameter with a storage capacity of approximately — gals.

The shell shall be — thick with bumped heads — thick and shall be constructed of the best rolled steel plate 55,000 lbs. tensile strength, longitudinal seams being double riveted and the girth seams single riveted. An 11x15 in. Eclipse manhole complete shall be located in rear head.

The heating capacity shall be — gals. per hour, heated from 40° to 180° Fahr. when supplied with steam at — lbs. gauge pressure. The heating element shall be located near bottom of heater, in a heavy iron casting riveted to head of shell, and attached with studs and nuts so as to be easily removable for inspection or cleaning; it shall consist of seamless copper tubes .065 in. thick, bent U-shape, difference in length of tubes between banks being not over 6 in., tubes of combined cross section area equal to, or greater than, area of — steam pipe, so arranged that the steam will make two passes through heater. Provide water relief valve, air relief valve, thermometer and automatic temperature regulator of proper size.

Instantaneous Service Heater—Install an instantaneous [horizontal or vertical] heater complete with all fittings. Heater to be of Whitlock Type "R" construction or approved equal. It shall be capable of handling — gals. of water per hour from 40° to 180° when supplied with steam at — lbs. gauge pressure. The shell shall be of cast iron or steel with all flanges machined. Heating section shall be of 1-in. outside diameter by No. 17 B.W.G. seamless drawn copper tubing. Tubing shall be made up of separate U-bends with ends expanded into a separate removable extra heavy rolled steel tube sheet. Shells shall be tested to hydrostatic pressure, equal to 50% more than the maximum working pressure; heating section to be tested to 150 lbs. Provide steam safety valve, water relief valve, air relief valve, thermometer and automatic temperature regulator of proper size.

Instantaneous Service Heater, Straight Tube Floating Head Type—For use with scale forming or unusually dirty waters.

Install an instantaneous [horizontal or vertical] heater complete with all fittings. Heater to be of Whitlock Type "S" construction or approved equal. It shall be capable of handling — gals. of water per hour from 40° to 180° when supplied with steam at — lbs. gauge pressure. The shell shall be of cast iron or steel with all flanges machined, and heating section of 1-in. outside diameter by No. 17 B.W.G. seamless drawn copper tubing. Tubes shall be straight expanded at one end into a fixed extra heavy rolled steel tube sheet bolted to front flange of shell, and at the other end into a floating tube sheet of the same material. The whole heating section shall be easily removable from shell. Water connections shall be so arranged that the front and rear heads may be easily removed for inspection or cleaning of tubes without breaking any pipe connections. The number of passes shall be so arranged that pressure drop through heater when handling specified amount of water will be not greater than — lbs. per sq. in. Shell shall be tested to a hydrostatic pressure equal to 50% more than maximum working pressure; heating section shall be tested to 150 lbs. Provide steam safety valve, water relief valve, air relief valve, thermometer and automatic temperature regulator of proper size.

Closed Feed Water Heater—Provide complete closed feed water heater [horizontal or vertical] of coil type design equal to Type "A", American Standard Feed Water Heater. Shell to be cast iron or steel with cast iron removable heads, heating surface to consist of at least 40 sq. in. copper tubing for each boiler horsepower. Heater shall be capable of heating full rating at 30 lbs. water per horsepower from 40° to 210° with steam at atmospheric pressure. Coil shall be of continuous brazed lengths of tubing, not less than No. 17 B.W.G., making up into bronze manifolds at inlet and outlet, which manifolds shall extend fully through side of shell with suitable gland packing that shall be required to pack shell joint against steam pressure only. Water connection shall be fully exposed outside shell with no threaded or expanded connections on the inside. Coils shall be supported by braces and swivel clamps so that there shall be no strains on the terminals or chafing of the tubing at any point by expansion and contraction. Provide safety valve, water relief valve, air relief valve and thermometer.

REPRESENTATIVES IN ALL PRINCIPAL CITIES

ARMSTRONG CORK & INSULATION COMPANY

Heat Insulating Materials for High Temperature Equipment

126 Twenty-fourth Street
PITTSBURGH, PA.

BRANCHES IN ALL THE LARGE CITIES

Products and Services

NONPAREIL INSULATING BRICK for furnaces, ovens, kilns, boiler settings, etc.

NONPAREIL HIGH PRESSURE BLOCKS and CEMENT for ovens, steam drums, breechings, heaters and other high temperature surfaces.

NONPAREIL HIGH PRESSURE COVERING for high pressure and superheated steam lines.

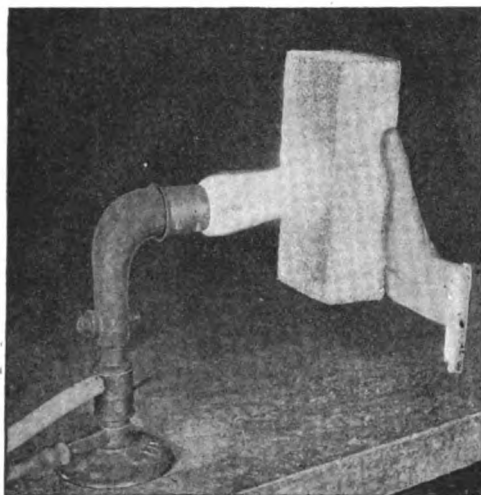
CONTRACTORS for HEAT and COLD INSULATION.

For Cold Storage Insulation, see page 302.

Nonpareil Insulating Brick

Nonpareil Insulating Brick combine high insulating efficiency with structural strength and heat resistance in a form readily adaptable to the insulation of furnaces, ovens, kilns, boiler settings and drums, lehrs, benches, stills, retorts and similar apparatus.

Nonpareil Brick are composed principally of diatomaceous earth, a cellular material of practically pure silica which, because it contains such a large amount of

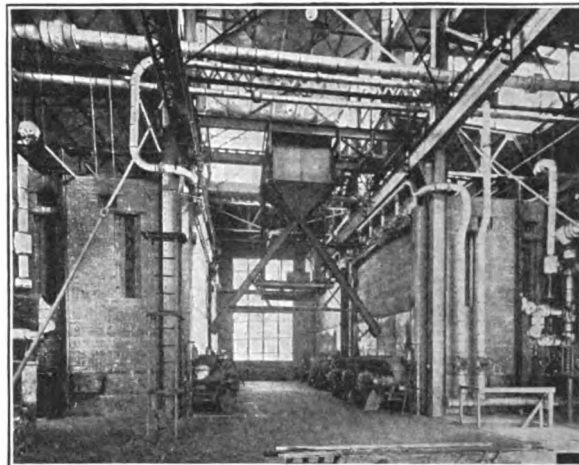


BLOWPIPE TEST ON NONPAREIL INSULATING BRICK

non-circulating air, is peculiarly effective in retarding the transmission of heat. Granulated cork is mixed with the raw earth, afterward being burned out, and the spaces thus left further enhance the insulating value of the finished product.

Insulating Value—Nonpareil Brick have many times the heat retarding value of common or fire brick. The use of a single $4\frac{1}{2}$ -in. course of Nonpareil Brick results in a saving of from 60% to 75% of the heat lost by conduction and radiation from uninsulated construction. As radiation loss frequently amounts to as much as 25% of the total heat, the resultant fuel economy is extremely important. Carefully checked operating records have shown fuel savings of 15% or more where Nonpareil Brick have been used in the construction.

Other Advantages—Though fuel economy alone is more than sufficient to justify their use, other results are of equal importance. More constant furnace

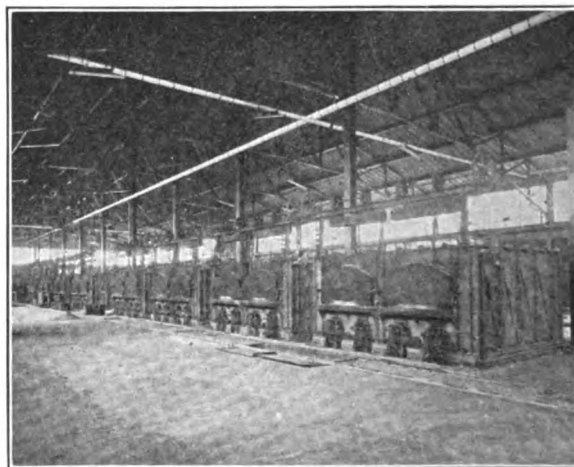


FOUR 1050-H.P. BOILERS OF THE DOMINION POWER & TRANSMISSION CO., HAMILTON, ONT.

Insulated in the walls and over the drums with Nonpareil Insulating Brick

temperatures assure greater uniformity of product and increased capacity. Less time is required to reach working heat. Lower temperatures are maintained in the workrooms with consequent improvement in morale and efficiency.

Structural Features—Being supplied in standard shapes and sizes, Nonpareil Brick are easily built in with fire brick or common brick. Their use involves no additional construction as they take the place of at least an equal number of other brick, the saving in the cost of which largely offsets the cost of insulation. Though averaging in weight only about 1.7 lbs. each, Nonpareil Brick have an ultimate crushing strength of 10 tons per sq. ft., and are therefore capable of carrying the weight and withstanding the strains encountered in high temperature equipment. Nonpareil Brick are not a refractory. They will, however, endure a direct heat of



HEAT TREATING FURNACES OF THE GENERAL MOTORS CO., DETROIT, MICH.

Insulated all around with a $4\frac{1}{2}$ -in. course of Nonpareil Insulating Brick

1650° Fahr. without change of form or quality, which, when properly installed, is ample for practically all conditions.

The advantages of solid insulation construction over former methods of insulating with loose materials packed in, or plastic cements applied externally, are obvious. Nonpareil Brick can not settle or pack or flake off. They are built into rigid, permanent construction, an integral part of the equipment itself.

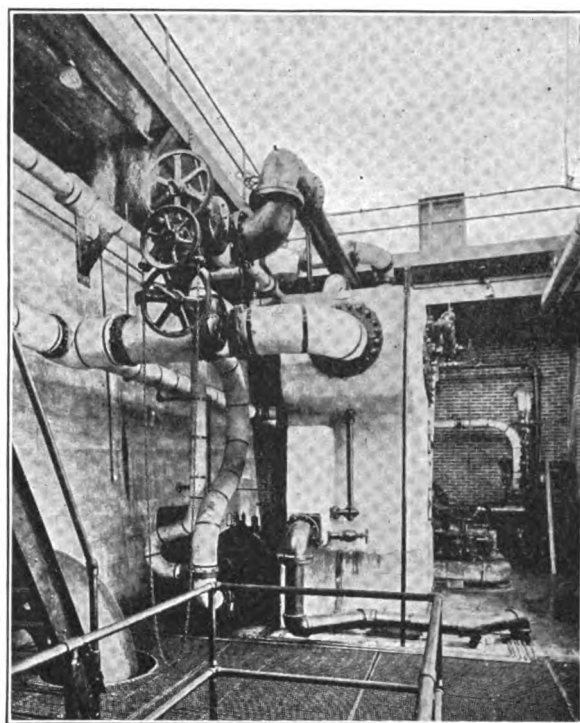
Further Information—The unusual merits of Nonpareil Insulating Brick and their many industrial applications are fully described in an illustrated publication of 72 pages, "Nonpareil Insulating Brick," which will be sent free on request. Many classes of equipment are treated separately and specifically, with operation records, detailed reports of tests and full specifications. The information given in this book is of exceptional value to designers and operators of industrial plants using high temperature equipment.

Nonpareil High Pressure Blocks

The insulating efficiency and structural features that characterize Nonpareil Blocks have demonstrated a decided superiority over other materials for the insulation of such apparatus as feed water heaters, evaporators, tanks, enameling, japanning, core baking and mold drying ovens, economizers, breechings, steam and still drums, etc. As in Nonpareil Insulating Brick, the chief ingredient of Nonpareil High Pressure Blocks is diatomaceous earth, mixed with asbestos fiber to serve as a binder. Here, again, the exceptional insulating property of the raw material accounts for the fact that carefully conducted tests against similar materials prove Nonpareil Blocks to possess approximately 12% greater heat retarding value.

Other Advantages—Insulation of this type, however, demands other qualities of equal or greater importance than low heat conductivity. For instance, the temperatures encountered are high, up to 1000° Fahr. or more. Hence, the insulation must be capable of withstanding this heat for long periods without change in structure or deterioration in quality. The ability of Nonpareil Blocks to meet this condition successfully has been repeatedly proved by service records in many industries. In an enameling oven in Detroit, Nonpareil Blocks were subjected to a continuous temperature of about 1000° Fahr. for a year, at the end of which time no change in any respect could be discerned.

Again, industrial conditions are frequently such that the insulation is exposed to moisture or even con-



PLANT OF THE DOMINION POWER & TRANSMISSION CO.,
HAMILTON, ONT.

Steam lines and feed water heater insulated with Nonpareil High Pressure Covering, Blocks and Cement

tinued soaking. All ingredients of Nonpareil Blocks are insoluble in water, and contain no chemicals to set up deteriorative action, whether wet or dry. After repeated wettings or complete submersion, Nonpareil Blocks, when dried out, will be found to have lost nothing in insulating efficiency or structural strength.

Nonpareil High Pressure Blocks are supplied in standard sizes, 3, 6 and 12 in. wide, 18 and 36 in. long, and in eight thicknesses between 1 and 4 in., inclusive. Special sizes can also be furnished. The structural strength of the blocks is sufficient to withstand shipment and handling with a minimum of breakage. Application is easy and inexpensive.

Nonpareil High Pressure Cement

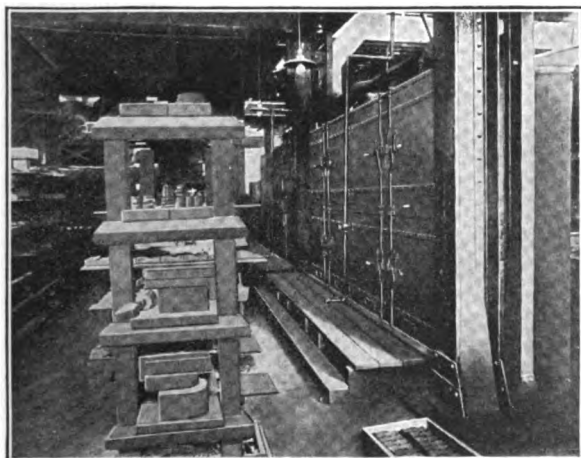
Nonpareil High Pressure Cement is composed of the same materials as the blocks, in loose form. It has the same insulating efficiency, possesses large covering capacity, and works easily to a good finish.

A detailed description of the characteristics, applications and results of using these materials is contained in a 20-page book, "Nonpareil High Pressure Blocks and Cement," which, together with samples, will be sent free on request.

Nonpareil High Pressure Covering

Nonpareil High Pressure Covering for steam lines is the same in composition as Nonpareil Blocks. It is supplied in 36-in. canvas covered sections and in five standard thicknesses. Not only is Nonpareil High Pressure Covering a better non-conductor of heat than other coverings on the market, but because of its ability to withstand high temperatures, it is particularly well suited for the insulation of superheated steam lines. Moreover, since it will bear repeated wetting and drying without injury, it is an ideal form of covering for underground steam lines.

An illustrated book, "Nonpareil High Pressure Covering, Blocks and Cement," gives detailed information which will prove of interest. Samples and literature will be furnished on request.



TWO 4-COMPARTMENT SHELF-TYPE CORE OVENS OF THE STROH CASTINGS CO., DETROIT, MICH.

2-in. Nonpareil High Pressure Blocks used for insulation

THE PHILIP CAREY COMPANY

Manufacturers of Heat Insulation

LOCKLAND, CINCINNATI, OHIO

FIFTY BRANCHES AND DISTRIBUTING POINTS IN NORTH AND SOUTH AMERICA AND EUROPE
 FACTORIES: LOCKLAND, OHIO, AND PLYMOUTH MEETING, PA.

Products

PIPE COVERINGS and INSULATION.

Also Insulating and Refractory Cements, and Miscellaneous Asbestos Products of all kinds.

For Waterproofing and Dampproofing Materials, see page 68; for Built-up Roofing, see page 142; for Expansion Joints, see page 168.

Carey 85% Magnesia Covering

Consists of approximately 85% basic hydrated carbonate of magnesia and approximately 15% asbestos fiber. Furnished in sections 3 ft. long, canvas covered, with metal bands, for sizes up to and including 10 in.; for larger sizes, segmental blocks are furnished. It is particularly adapted for use on high pressure and superheated steam pipes.

EFFICIENCY OF CAREY 85% MAGNESIA

Thick- ness	10 lbs.	120 lbs.	200 lbs.
1"	83.1%	86.2%	87.1%
2"	88.1%	90.4%	91.1%
3"	90.7%	92.5%	93.1%

Standard size of blocks, 6x36 in.; thickness, $\frac{1}{2}$ in. to 4 in., inclusive

Carey Impervo Covering

Composed of alternate layers of high grade porous wool felt and waterproof paraffin paper and has an inner lining of an inner paraffin paper. Furnished in standard sections 36 in. long, finished with canvas jacket and bands for applying for all pipe sizes. Specifically designed for use on cold water and ice water lines to prevent sweating and to maintain the low temperature of the liquid. It should always be applied in double layers to break all seams and joints to prevent air reaching the pipe. The wool felt provides insulation and the paraffin paper prevents moisture or air penetration.

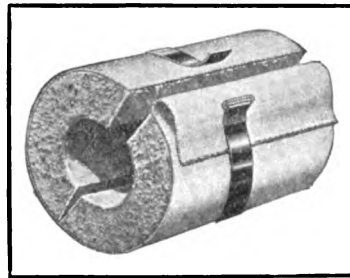


TRADE-MARK

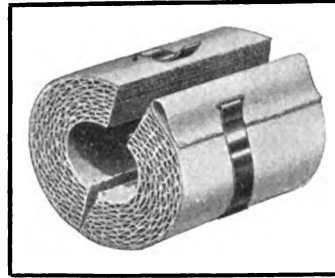
Carey Carocel Covering

Consists of alternate layers of fine corrugated and flat sheets of asbestos paper. Furnished in standard 36-in. long sections, canvas jacketed with bands for applying for all pipe sizes. Specifically designed to give maximum insulating value on low and medium temperature steam pipes. Better adapted than any other type of covering for temperatures ranging from hot water up to 35 lbs. steam pressure.

The long flat corrugations provide a minimum number of points of contact between layers for heat transfer and maximum surface resistance to internal convection currents.



CAREY 85% MAGNESIA



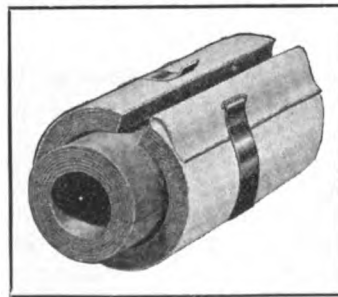
CAREY CAROCEL

MONETARY LOSSES RESULTING FROM HORIZONTAL BARE STEAM PIPE

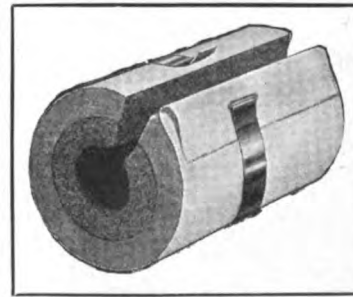
Published by the courtesy of the Magnesia Association of America

Gauge pressure	Hot water	10 lbs.	80 lbs.	120 lbs.	160 lbs.	200 lbs.
Temperature	180° Fahr.	239.4° Fahr.	324.0° Fahr.	350.0° Fahr.	370.7° Fahr.	387.9° Fahr.
Pipe size	Loss per month, 24-hr operation, per 100 lin. ft.					
1"	\$1.94	\$3.37	\$5.95	\$6.88	\$7.68	\$8.36
2"	3.09	5.40	9.63	11.15	12.48	13.65
3"	4.31	7.56	13.50	15.68	17.55	19.20
4"	5.40	9.48	16.95	19.70	22.08	24.15
6"	7.73	13.54	24.25	28.23	31.70	34.65
8"	9.90	17.38	31.40	36.28	40.73	44.55
10"	12.23	21.45	38.58	44.88	50.28	55.10
12"	14.41	25.33	45.50	53.00	59.48	65.05
14"	15.75	27.65	49.75	57.95	65.50	71.23
16"	17.95	31.55	56.73	66.03	74.20	81.18

NOTE—In these tables, coal has been figured at \$4.00 per ton of 2000 lbs.; 13,000 B.t.u. per lb. of coal; labor, boiler room expense, etc., taken at \$1.00 per ton, making total value of coal fired at \$5.00 per ton. Boiler efficiency taken at 70%. Air temperature 70° Fahr. Experimental data obtained at the Mellon Institute and applied to Peclet's formulae.



CAREY IMPERVO



CAREY PROTECTO

EFFICIENCY OF CAREY CAROCEL

Thick- ness	180° Fahr.	10 lbs.	80 lbs.
1"	82.5%	83.7%	85.0%
1 1/2"	86.4%	87.1%	88.2%
2"	88.8%	89.6%	90.4%

Sheets or blocks furnished 6 in., 12 in. or 36 in. long and in any thickness

Carey Protecto Covering

Consists of an inner layer of hair felt and an outer layer of wool felt.

Furnished in sections 36 in. long, finished with canvas jacket with bands for applying for all pipe sizes. The insulating properties of these materials are well known and Protecto furnishes a combination resulting in high insulating value and neat appearance which is so often lacking when hair felt only is used.

Specifically designed to protect cold water and compressed air pipes from freezing.

Specifications for Insulating Power Plants

Boilers—Cover all exposed boiler tops, combustion chambers and drums with Carey 85% Magnesia Blocks 2 in. thick, firmly wired on and finished with a 1/2-in. coat of Carey No. 100 Hard Finish Asbestos Cement, troweled smooth.

On connections from boiler to smokestack, apply V-rib

Continued on next page

expanded metal lath to provide an air space of approximately $\frac{3}{4}$ in. Then apply Carey 85% Magnesia Blocks, 2 in. thick firmly laced in place and covered with hexagonal wire mesh, stretched tight and finished with a $\frac{1}{2}$ -in. coat of Carey No. 100 Hard Finish Asbestos Cement.

Apply a thin coating of Carey B. T. U. Cement over entire exposed brick boiler wall surface. Use from 45 to 50 lbs. of cement per 100 sq. ft. of surface. Then apply a 2-in. coat of Carey 85% Magnesia Cement reinforced with wire mesh fastened to brickwork and finish with a coat of Carey No. 100 Hard Finish Asbestos Cement.

High Pressure Steam Piping—Cover all high pressure saturated steam pipes 4 in. in diameter and larger with double standard thick 85% Magnesia Pipe Covering. Cover all high pressure steam pipes under 4 in. in diameter and all high pressure drip pipes with 2-in. Carey 85% Magnesia Pipe Covering.

For superheated steam pipes 4 in. in diameter and larger, use double $1\frac{1}{2}$ -in. Carey 85% Magnesia Pipe Covering; on pipes smaller than 4 in., use double standard thick 85% Magnesia Pipe Covering.

Exhaust Steam Piping—Cover all exhaust pipes and mains within buildings with 1 layer of $1\frac{1}{2}$ -in. Carocel Asbestos Sectional Pipe Covering.

Feed Water Piping—Cover all feed water pipes with 1 layer of 1-in. Carocel Asbestos Sectional Pipe Covering.

Fittings—Cover all high pressure and exhaust steam fittings, valves and flanges with Carey 85% Magnesia Blocks and 85% Magnesia Cement, or all 85% Magnesia Cement, to a thickness corresponding to covering on adjacent pipe. Trowel smooth and finish with canvas jacket pasted on.

Finish—Over all pipe covering, apply a 16-lb. asbestos paper and an extra 8-oz. canvas jacket, tightly stretched and sewed on, approximately 3 stitches to the inch. All canvas surfaces are to be sized and finished with 2 coats of lead and oil paint of color to be selected by architect.

Heaters, Receivers, Tanks, Traps, etc.—Cover all such appurtenances with Carey 85% Magnesia Blocks and Carey No. 100 Hard Finish Asbestos Cement to a minimum thickness of $1\frac{1}{2}$ in., or with 1-in. Carocel Blocks and $\frac{1}{2}$ -in. Carey No. 100 Hard Finish Asbestos Cement. Wire blocks securely in place, cover with 2-in. hexagonal

wire mesh, stretched tight, and apply Carey No. 100 Hard Finish Asbestos Cement, troweled smooth.

Finish with canvas jacket smoothly pasted on. Canvas jacket shall be of same weight as used on 85% Magnesia Pipe Coverings.

Specifications for Insulating Heating Systems

Boilers, Heaters, etc.—Cover all such appurtenances with Carey 85% Magnesia Blocks and Carey No. 100 Hard Finish Asbestos Cement to a minimum thickness of $1\frac{1}{2}$ in., or with 1-in. thick Carocel Blocks and $\frac{1}{2}$ in. thickness of Carey No. 100 Hard Finish Asbestos Cement. Wire blocks securely in place, cover with 2-in. hexagonal wire mesh, stretched tight, and finish with Carey No. 100 Hard Finish Asbestos Cement, troweled smooth.

Heating Pipes—Cover all mains, risers and returns (except horizontal radiator connections) with 1 in. thick Carocel Asbestos Sectional Pipe Covering.

Fittings—Cover all fittings and valves (except radiator valves) with asbestos cement approximately 1 in. thick, troweled smooth, and finish with canvas jacket smoothly pasted on. The canvas shall be the same weight as that used on the pipe covering.

Finish—All exposed canvas jackets shall be sized and painted with 2 coats of lead and oil paint of color selected by the architect. Pipe covering bands shall be applied on 18-in. centers.

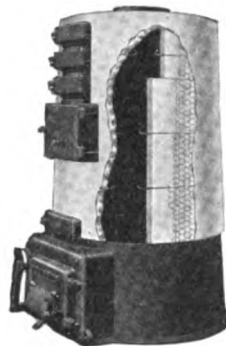
Specifications for Insulating Plumbing Systems

Hot Water Piping—Cover all hot water mains and piping with Carocel Asbestos Sectional Pipe Covering 1 in. thick.

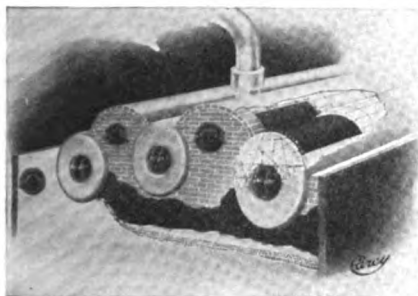
Cold Water Piping—Cover all cold water pipes within buildings, whether exposed or concealed, with Impervo Pipe Covering, in 2 layers, applied by the broken joint method, each layer being $\frac{1}{2}$ in. thick. Cover all cold water pipes in entrances, areaways, unheated rooms or otherwise exposed to freezing, with Protecto Pipe Covering 1 in. thick.

Ice Water Piping—Cover all ice water pipes, whether exposed or concealed, with Impervo Pipe Covering, in 2 layers, applied by the broken joint method, each layer being $\frac{3}{4}$ in. thick.

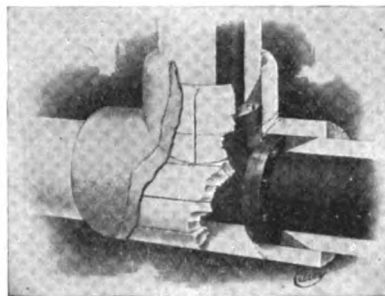
Finish—Same as for heating system.



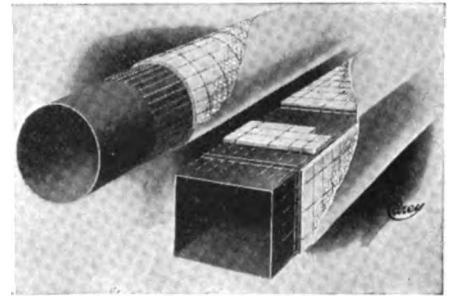
METHOD OF INSULATING
BOILERS, HEATERS,
TANKS, ETC.



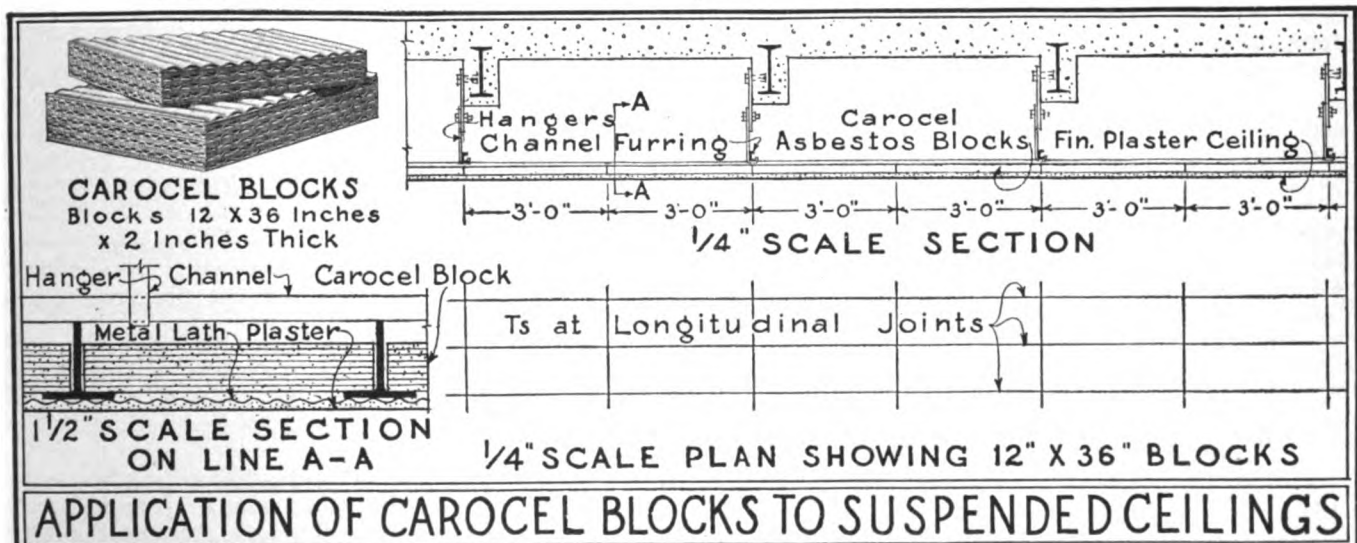
METHOD OF INSULATING BOILER
TOPS,
ENDS AND WALLS



METHOD OF INSULATING FITTINGS,
FLANGES, ETC.



METHODS OF INSULATING BOILER
BREECHINGS



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Service

Johns-Manville Power Plant, Roofing and Building Materials are backed by the responsibility of JOHNS-MANVILLE INC., which assures the engineer better service, better value and greater satisfaction, because of the long, economical service these materials afford. Full details, specifications and drawings will be gladly furnished by the engineering department of our nearest branch office. Johns-Manville engineers will be glad to confer on any insulation problems of boilers, hot and cold pipe systems (inside, outside or underground); packing of rods and pistons; waterproofing; the use of radiator or steam traps, or roofing materials.

Johns-Manville Underground System of Pipe Insulation

The underground method of distribution of steam and hot water is the most desirable, convenient and economical, provided the system installed meets three important qualifications:

(1) Its efficiency must be equal to, or greater than, that attained with properly insulated pipes running indoors. (2) Its insulating value must not depreciate more rapidly than the pipe itself. (3) Its cost per year, based on its saving of heat and its great durability, must be less than the cost of others.

The Johns-Manville Underground System of Pipe Insulation provides a permanent, efficient and economical means of placing underground, and insulating, pipes conveying steam or hot water.

The efficiency of the Johns-Manville System is at least 90% when installed according to the Johns-Manville specifications, and by them or under their supervision. This efficiency is maintained for a long

period of time on account of the character of the materials used in the construction of this system.

Johns-Manville Pipe and Boiler Insulation

One of the most important results of the development of asbestos by Johns-Manville has been the saving of heat through insulation. Johns-Manville have developed materials, built on asbestos as a base, that retard the escape of heat from boilers, furnaces, pipes and flues. Twenty-seven years' specialization, directed by the highest engineering talent, has enabled Johns-Manville to develop and produce insulations of exceptional efficiency and durability under every service condition.

Asbesto-Sponge, for example—a remarkable felt which combines the insulating value of sponge with the heat resistance and endurance of asbestos—ranks first in efficiency among commercial steam pipe insulations; or 85% Magnesia or Asbestocel, Zero, Anti-Sweat or Brine and Ammonia Insulations. Whatever the needs, they can be met efficiently with one of the Johns-Manville insulations tabulated below:

Service	Type of Insulation	Insulation Recommended
Steam pipes, all pressures	Sectional	Asbesto-Sponge Felted; 85% Magnesia
Medium and low pressure steam pipes	Sectional	Improved Asbestocel
Low pressure steam and hot water pipes	Sectional	Improved Asbestocel
Anti-freezing	Built-up and sectional	Built-up Hair Felt; Zero
Brine and ammonia pipes	Built-up and sectional	Brine and Ammonia; Anti-Sweat
Cold water pipes	Built-up and sectional	Anti-Sweat or Built-up
Boiler insulation	Sheet and block, and cement	Asbesto-Sponge; Asbestocel; 85% Magnesia; Cements, Nos. 302, 400, 85% Magnesia.
Stack lining	Sheets	Vitribestos

Johns-Manville Packings

Johns-Manville packing design provides for economy by reducing friction and preventing leakage losses. By designing for service, JOHNS-MANVILLE INC. have reduced friction and wear of rods and packings at no sacrifice of tightness.

Engineers have found that instead of having to repack several times a season, a set of Johns-Manville Sea Rings often lasts several seasons, because the heavy wear on packings, wear of the rod, and loss of power

through friction, so common with other forms of packings, have been reduced to a minimum. Economical service is afforded by Universal Piston Packing, Service Sheet, Kearsarge Gaskets, Vulcabeston Pump Valves, Sea Rings and by all the Johns-Manville line.

Johns-Manville Refractory Cements

Johns-Manville High Temperature Cements are composed of highly refractory minerals, which, when thoroughly mixed with water to the consistency of mortar or grout, are especially adapted for use as a bond between, or coating of, fire brick and monolithic baffle walls for withstanding the action of flame and severe temperatures.

The three cements used for general plant conditions are Nos. 31, 26 and 32. Cements No. 31 and No. 26 are used for bonding, while No. 32 is used as a coating to protect the exposed face of the brick.

These cements are designed to resist high temperatures without fusing or melting, and to provide for continual expansion and contraction of fire settings without disintegrating. Their use in place of fire clay and other mixtures with lower fusing points will greatly increase the life of boiler and other fire brick settings.

Nos. 33 and 35 Super-Refractories are available for temperatures as high as 3300° and 3500° Fahr. respectively.

Johns-Manville Electrical Materials

The "Noark" line of electrical protective devices is complete. It comprises: Cartridge enclosed fuses, renewable and non-renewable, cut-out bases, main line and branch fuse and switch boxes, primary distribution fuse boxes, underground junction and distribution boxes, service meter protective devices, externally operated switch boxes, "Allsafe" switches, and a complete line of accessories. This entire line is the result of many years conscientious effort to produce the best and most dependable electrical protective devices. The satisfactory service they render wherever used is positive evidence that this effort has been successful, and furnishes obvious proof of Johns-Manville responsibility.

Johns-Manville Steam Traps

These traps are suitable for power plant requirements and are generally used in sizes with connections from $\frac{3}{4}$ to 2 in. inclusive. Permit free discharge of water without loss of steam. The action is direct—that is, operation depends on the movement of the water flowing into them, rather than the temperature or the pressure of the steam.

There is just one moving part—a ball, which is held against the discharge bushing by unbalanced pressure and rises when water flows into the chamber. Whenever the water level rises to a certain point above the discharge orifice, the buoyant force of the water rolls the ball up and exposes part of the discharge orifice, allowing free escape of water and air. As the water level lowers, the ball settles back and closes the discharge orifice, and the water seal which is maintained prevents steam leakage; operation is continuous, for it discharges as the water is received.

Johns-Manville Radiator Traps

These devices permit free discharge of water and air from radiators without loss of steam, whether the system operates by gravity or vacuum. Similar to Johns-Manville Steam Traps in construction and principle.

Johns-Manville Asbestos Roofings

Asbestos rock fiber, a fireproof, timeproof and weatherproof mineral is the base of all Johns-Manville

Asbestos Roofings, which are made in a variety of forms for every roofing need.

Johns-Manville Standard and Colorblende Asbestos Shingles are made of asbestos fiber and portland cement united under hydraulic pressure. Furnished in various sizes and shapes in four colors, $\frac{1}{8}$ and $\frac{1}{4}$ in. thick.

Johns-Manville Flexstone Asbestos Shingles are made of asbestos felt surfaced with crushed red or green slate.

Johns-Manville Asbestos Ready-to-lay Roofing is made of asphalt impregnated asbestos felts, smooth surface both sides, in 3 weights—light, medium and heavy; or with red or green slate surfacing one side.

Johns-Manville Asbestos Built-up Roofing consists of asphalt impregnated asbestos felts built up on the roof deck in the required thickness by Johns-Manville workmen.

Johns-Manville Corrugated Asbestos Roofing for skeleton frame buildings is made of asphalt impregnated sheets of asbestos felt reinforced with sheet steel.

Johns-Manville Transite Corrugated Asbestos Wood for roofing and siding on skeleton frame buildings is made of asbestos fiber and portland cement united under hydraulic pressure into dense, rigid, fireproof sheets, 42x96x $\frac{1}{4}$ in. thick.

Johns-Manville Asbestos Roofings are approved by the Underwriters' Laboratories, Inc., and take base rates of insurance.

Johns-Manville Asphalt Industrial Flooring

This flooring is in the nature of an asphaltic concrete and consists of a binder, or cement, made up of a combination of natural asphalts and a well graded mineral aggregate of torpedo gravel, crushed stone and sand, with particles ranging in size from those passing a $\frac{3}{4}$ -in. mesh screen down to those which pass a 200-mesh screen.

Johns-Manville Industrial Flooring can be laid in any consistency between extreme hardness and softness and, while always dense, possesses a certain amount of resiliency. Does not cause foot soreness and fatigue like concrete and other non-yielding floor surfaces; and where employes of machine shops, factories, and other industries are compelled to stand while at work, it adds greatly to their comfort and efficiency. Furthermore, being damp-proof, it is a protection against ailments common to dampness.

This is essentially a floor that is "made to fit"; each installation should be treated as an individual problem and a specification written to meet the exact requirements. A brief description of conditions sent to any of our Branch Engineering Departments will bring immediate response.

Johns-Manville Asbestos Wood

A fireproof building material made of asbestos fiber and portland cement. Recommended for use as a fire barrier in factories, foundries, warehouses, machine shops and wherever a fireproof building material is required, in any of the following forms: Smoke breechings, roofing, sheathing, window casings, mouldings, cabinets, tank linings, ceilings, floorings, battens, boxes and receptacles, fire doors and partitions. It is also impervious to the action of most commercial chemicals.

It has a gray surface which requires no painting, but it can be painted, varnished or grained to match surroundings when desired. Can be fastened with nails or screws and does not distort, chip or weaken in service. Comparatively light in weight and has a modulus of rupture of 3500 lbs. per sq. in. under transverse loads. Approved by the Underwriters' Laboratories, Inc.

KEASBEY & MATTISON COMPANY

Manufacturers of 85% Magnesia Coverings for Insulation

AMBLER, PA.

BRANCH OFFICES

ATLANTA, GA.
BOSTON, MASS.
BALTIMORE, MD.
BUFFALO, N. Y.

WILKES-BARRE, PA.

CHICAGO, ILL.
CINCINNATI, OHIO
CLEVELAND, OHIO
DETROIT, MICH.

TORONTO, ONT.

MILWAUKEE, WIS.
MINNEAPOLIS, MINN.
NEW YORK, N. Y.
NORFOLK, VA.

PHILADELPHIA, PA.
PITTSBURGH, PA.
SYRACUSE, N. Y.
WASHINGTON, D. C.
MONTREAL, CAN.

Product

85% MAGNESIA COVERING for steam pipes, boilers and other heated surfaces.

Application

Manufactured in half sections for standard sizes of pipe up to 10 in. in diameter; in segments for larger pipe and for other curved surfaces; in blocks for flat surfaces and flat-surface boilers; in the form of plastic or fibrous powder for application to joints and other irregular surfaces.

General Characteristics of Product

The efficiency of an insulating agent depends primarily on the number of dead-air cells. Due to improved methods of production and the use of only the best grades of asbestos, "K & M" 85% Magnesia covering contains the maximum percentage of dead-air spaces and yet retains the necessary structural strength. The cell construction is such that a cubic inch of "K & M" Magnesia covering thrown into a bowl of water will require about 60 seconds to sink, whereas inch cubes of various other kinds of pipe coverings will sink in from 4 to 47 seconds.

TABLE NO. 2—THICKNESS OF 85% MAGNESIA FOR MAXIMUM NET SAVING
S=Standard Thickness; DS=Double Standard Thickness (See Table No. 1).

COAL AT \$2.00 PER TON						COAL AT \$4.00 PER TON					
Size pipe, in.	Hot water 175° F.	Steam 5 lbs.	Steam 100-200 lbs.	200 lbs. 150°F. super-heat	200 lbs. 300°F. super-heat	Size pipe, in.	Hot water 175° F.	Steam 5 lbs.	Steam 100-200 lbs.	200 lbs. 150°F. super-heat	200 lbs. 300°F. super-heat
3/4	S	S	S	1 1/2"	DS	3/4	S	S	1 1/2"	DS	2"
1 1/4	S	S	S	1 1/2"	DS	1 1/4	S	S	1 1/2"	DS	2"
3	S	S	S	1 1/2"	DS	3	S	S	DS	DS	3"
6	S	S	1 1/2"	2"	DS	6	S	1 1/2"	DS	3"	4"
12	S	S	1 1/2"	2"	DS	12	S	1 1/2"	DS	3 1/2"	4"
24	S	S	2"	3"	DS	24	S	1 1/2"	DS	3 1/2"	4"
Flat	1"	1 1/2"	2"	3"	3 1/2"	Flat	1 1/2"	2"	3 1/2"	4"	5"

COAL AT \$6.00 PER TON						COAL AT \$8.00 PER TON					
Size pipe, in.	Hot water 175° F.	Steam 5 lbs.	Steam 100-200 lbs.	200 lbs. 150°F. super-heat	200 lbs. 300°F. super-heat	Size pipe, in.	Hot water 175° F.	Steam 5 lbs.	Steam 100-200 lbs.	200 lbs. 150°F. super-heat	200 lbs. 300°F. super-heat
3/4	S	S	DS	2"	2"	3/4	S	1 1/2"	1 1/2"	2"	3"
1 1/4	S	1 1/2"	DS	2"	3"	1 1/4	S	1 1/2"	2"	3"	3"
3	S	1 1/2"	DS	3"	3"	3	1 1/2"	2"	3"	3"	3"
6	1 1/2"	2"	DS	3"	4"	6	1 1/2"	2"	3"	4"	4"
12	1 1/2"	2"	DS	4"	5"	12	2"	3"	4"	5"	5 1/2"
24	1 1/2"	2"	DS	4"	5"	24	2"	3"	4"	5"	5 1/2"
Flat	2"	3"	4"	5"	6"	Flat	2 1/2"	3 1/2"	4 1/2"	6"	7"

N.B.—These tables, with the curves accompanying, are based on the latest determination of fact, arrived at by the Mellon Institute of Industrial Research, Pittsburgh, Pa.

How to Use Table No. 2

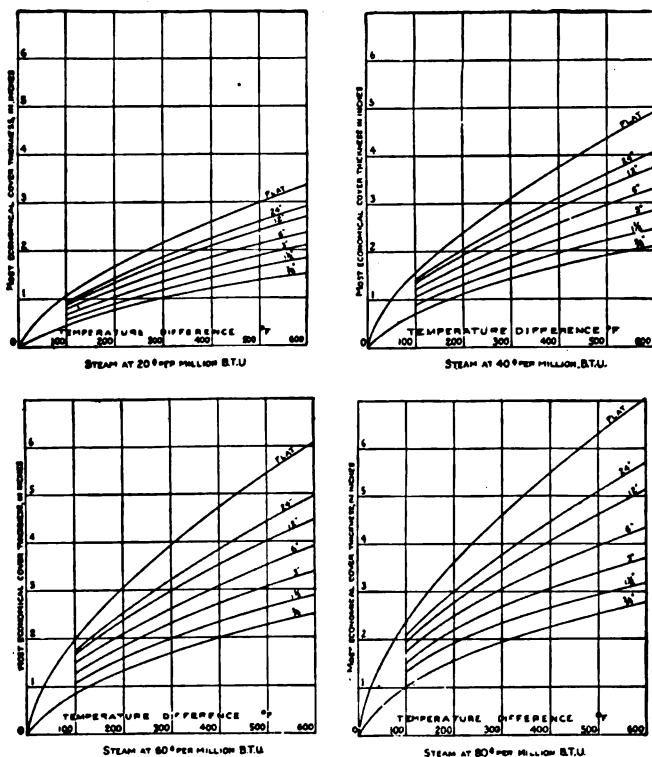
Determine the following factors in connection with the heated surfaces to be covered: cost of coal, steam pressure and size of pipes. Select the table most nearly corresponding to the cost of coal, and the column in table nearest to the condition of steam pressure or temperature. The thicknesses in this column are the proper thicknesses for pipe sizes given at the left.

Example—Cost of coal \$3.75, steam pressure 150 lbs., size of pipe 12 in. Select the \$4.00 per ton table, and the column headed, "Steam 100-200 lbs." Run down this column to the 12-in. line and find that Double Standard (D. S.) is the proper thickness for maximum net saving.

Explanation of Tables and Curves

The thicknesses given in these tables and curves are the proper thicknesses for the maximum net saving for each condition. They are based on a period of service of 8760 hours per year.

Where pipes are cold part of the year, multiply the cost of coal by the number of hours per year the pipes are hot and divide by 8760; use the value obtained instead of the actual coal cost. 20% of the cost has been allowed as the cost of application, and 13% of the total cost for the annual fixed charges (6% interest, 5% depreciation, 2% miscellaneous). The values of the heat losses used in calculating the net savings are based on a series of experiments, covering a period of three years, made for the MAGNESIA ASSOCIATION OF AMERICA by the Mellon Institute of Industrial Research of the University of Pittsburgh.



CURVES SHOWING THICKNESS OF 85% MAGNESIA FOR MAXIMUM NET SAVING

For use in plants where heat costs, steam temperatures, etc., are accurately known.

These curves are based on the latest determinations of fact, arrived at by the Mellon Institute of Industrial Research.

The tables are for use in plants where costs are not accurately known. They are based on average conditions. In transforming the steam cost to coal cost, it has been assumed that 75% of the cost of steam is coal cost, that 1 lb. of coal will evaporate 7 lbs. of water, and that each pound of steam contains 1000 B.t.u. above the feed water temperature.

The curves are for use in plants where heat costs, steam temperatures, etc., are accurately known. They are applicable to all heated surfaces, since they are based on the temperature of the surface and the value of the heat in dollars per million B.t.u.

Efficiency

Extensive tests show that the efficiency of 85% Magnesia covering of standard thickness will be all the way from 75% to 97% of the total heat wasted by bare pipes. The curves on preceding page and Table No. 2 show the proper thicknesses of covering for the maximum net saving.

Durability

"K & M" coverings have been in use for periods of 20 to 25 years without apparent deterioration. Even soaking in water for a number of months, as has happened a number of times in cases of sunken ships, does not destroy usefulness. Some pipe coverings, fairly efficient at moderate temperatures, are impaired by excessive heat through the charring or carbonizing of the inner covering. "K & M" 85% Magnesia pipe coverings have been subjected to continued heat ranging from 700° to 900° for months with the only result a calcination of the inner zone of the covering which actually increased the efficiency of the pipe covering about 3%.

Particular Features of "K & M" Coverings

"K & M" Magnesia pipe and boiler coverings are characterized by the important feature of *lightness*. The real insulating agent in 85% Magnesia coverings is the dead air cell confined by the carbonate of magnesia. The more of these, the more efficient the pipe covering, so long as the necessary structural strength is maintained. Instead of using the ordinary short fiber asbestos, KEASBEY & MATTISON COMPANY uses carded, long fiber asbestos of high quality—from its own mines—with the result that its 85% magnesia coverings have all the necessary strength with less of the inert fiber. "K & M" Magnesia coverings are always guaranteed to exceed 85% of carbonate of magnesia. Purchasers are urged to buy such coverings by lightness of weight. In buying lightness, the purchaser is buying insulation rather than dead weight.

Table No. 3 shows the "K & M" warranted weights of 85% magnesia sectional covering in the various thick-

nesses and 1 ft. lengths, as well as the "K & M" warranted weights for sectional blocks of the same thicknesses in square foot sizes. Improved methods of manufacture give not only a covering that is less of a load for pipe lines but a covering that shows itself to be about 4% more efficient than other Magnesia coverings.

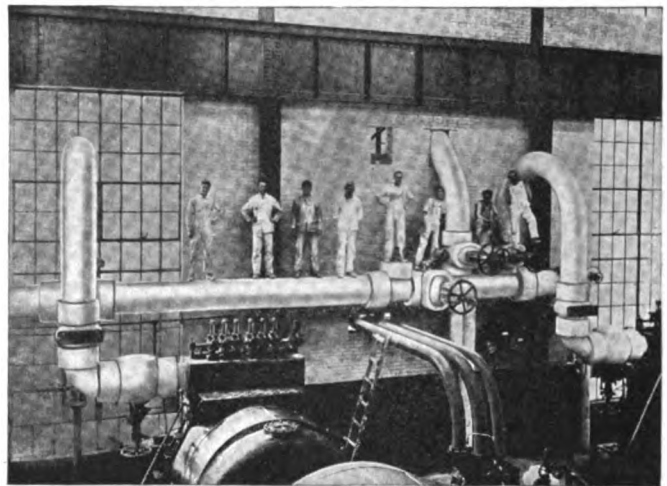
TABLE NO. 3.—WEIGHTS ESTABLISHED BY "K & M" MANUFACTURING METHODS FOR 85% MAGNESIA SECTIONAL AND BLOCK COVERINGS

Magnesia sectional covering 1 ft. long		Magnesia sectional blocks 1 sq. ft.	
Size, in.	"K & M" warranted weight per section, lbs.	Thickness, in.	"K & M" warranted weight per sq. ft., lbs.
1/2	1.41	1/2	.763
3/4	1.5	3/4	None milled 1921
1	1.8	1	1.256
1 1/4	2.125	1 1/4	1.59
1 1/2	2.25	1 1/2	1.59
2	3	1 3/4	1.938
2 1/2	3.5	2	2.596
3	4	2 1/2	3.25
3 1/2	5	3	3.567
4	5.5	4	6.11
4 1/2	6		
5	7		
6	8		
7	10		
8	12		
9	13		
10	14		

General Service Experience

The KEASBEY & MATTISON COMPANY is one of the largest and oldest producers of 85% Magnesia pipe and boiler coverings and has served the largest power interests during the last 30 years. Notable examples are the following:

U. S. Naval Department
Stone & Webster Corp., Boston, Mass.
Dwight P. Robinson, New York, N. Y.
New York Shipbuilding Corp., Camden, N. J.

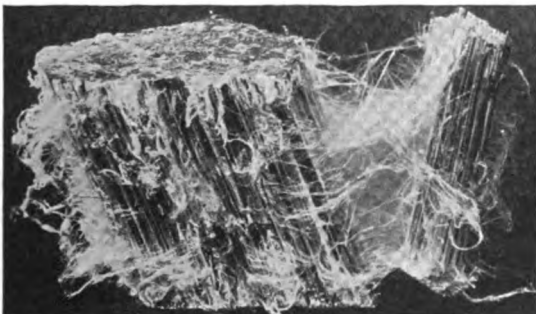


"K & M" MAGNESIA COVERING, PLANT OF OTIS STEEL CO., CLEVELAND, OHIO

Specification Data

The KEASBEY & MATTISON COMPANY is glad to supply to any one interested the full standard specifications as approved and adopted by the Magnesia Association of America. When it is not possible to include these entire specifications, it is suggested that the following condensed requirement be made a part of the contract:

Non-conducting Covering—All exposed boiler surfaces, all pipes, fittings, or appurtenances carrying steam, hot water or hot gases, where radiation would cause condensation or drop in temperature, or result in loss of B.t.u. which could be utilized, shall be thoroughly insulated as specified in Magnesia Association Specification for 85% Carbonate of Magnesia Non-conducting Coverings.



CARDED LONG FIBER ASBESTOS

The use of carded asbestos fiber in Keasbey & Mattison Magnesia pipe covering makes it possible to materially increase the carbonate of magnesia and the coal saving efficiency of the covering

NORRISTOWN MAGNESIA & ASBESTOS CO.

NORRISTOWN, PA.

BRANCH OFFICE: 23 Lewis Wharf, BOSTON, MASS.

FACTORIES: NORRISTOWN, PA., DOYLESTOWN, PA., and PLEASANT MILLS, N. J.

Products

ASBESTOS MAGNESIA PIPE and BOILER COVERINGS and CEMENT; ASBESTOS BLOCK, BOARD and PAPER.

Also manufacturers of Cloth and Wick Packing; Asbestos Sheet Packing and Gaskets.

Pipe Coverings

Pipe coverings are furnished for a wide range of applications to steam and water pipes.

"Diamond N" 2-Point Covering—An asbestos paper, which gives high efficiency as a heat insulator, is specially prepared in which the center consists of a layer of magnesia or other highly non-conducting material, with asbestos fiber as a binder.

The pipe covering is then made up of a series of wrappings of this asbestos paper.

The two points that make this covering superior to others of equal thickness are:

(1) The soft center of the asbestos paper makes it a good heat insulator.

(2) This asbestos paper is crimped or ruffled, so that as it is wound upon itself, the roughened surface forms very small air pockets in which the air is entrained thereby increasing the insulating effect.

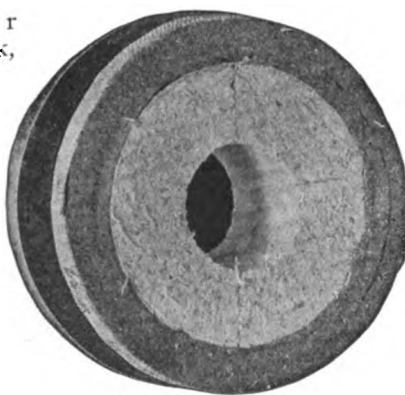
This covering is particularly suitable for the highest steam pressures and superheat.

Asbestos Magnesia—A sectional covering for high and low pressure steam work; of solid construction, light in weight, particularly strong and easily handled with small breakage. Uninjured by being water soaked, if allowed to dry without being disturbed.



ASBESTOS MAGNESIA COVERING

"Ideal"—For high pressure work, also for pipe lines exposed to weather when water-proofed. Made up of our standard magnesia asbestos with a 1/2-in. jacket of wool felt added. This jacket of wool felt, being applied by the broken joint method over the inner core of asbestos magnesia, gives a much higher efficiency and also serves as an excellent protection to the inner core against breakage and hard usage.



"IDEAL" COVERING

Indent—Adapted for use wherever excessive vibration is to be provided for. Made up from our asbestos paper, which has been indented previous to rolling. This is one of the most substantial coverings that we have

produced, its particular qualities being efficiency and durability.

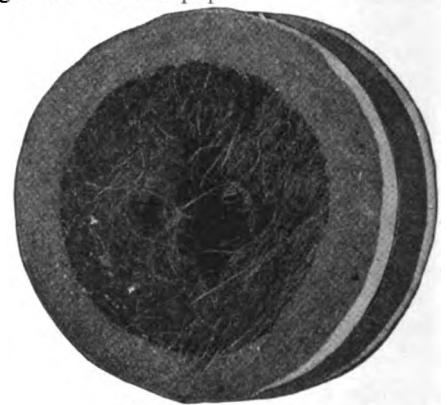
Felt—For hot water work. Made any thickness, of a body of superior wool felt. Lined inside with asbestos paper. Has proved an exceptional non-conductor for all low temperature heating work. We recommend 3/4-in. thickness for hot water work.

Sweatproof—Particularly adapted for cold water lines through warm or damp rooms to prevent sweating and dripping. Made by our special process from a special quality of wool felt and lined with tarred paper.

Cold Water Pipe—For exposed pipe lines. Made from the highest quality of wool felt and lined with the thickest, heaviest grade of tarred paper.

Frostproof

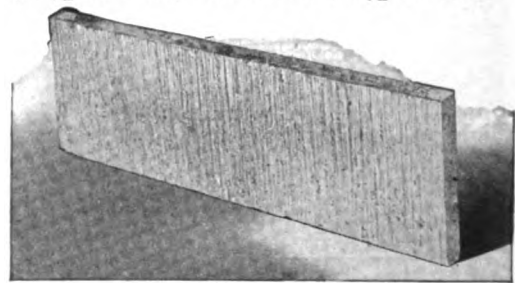
—For outdoor pipe lines exposed to the severest weather. Composed chiefly of hair felt and wool felt. Fittings should be lapped securely with hair felt and canvas. This covering gives exceptional protection to outdoor water lines, protecting them from frost.



FROSTPROOF COVERING

Block, Board and Paper

Asbestos Magnesia Block—For covering large pipes, heaters, stacks, boilers, and flat surfaces. These blocks contain virtually the same materials as our high pressure coverings, except that asbestos fiber of extra lengths is used to give all possible strength. Made 6x18x1, 1 1/2 or 2 in., and 3x18x1, 1 1/2 or 2 in.



ASBESTOS MAGNESIA BLOCK

Asbestos Air Cell Block, Indented Board, "Conomic" Board, Mill Board—Acidproof and fireproof. For lining walls and ceilings and covering hot surfaces.

Asbestos Paper—Plain and corrugated. Made of pure asbestos. For covering hot air pipes and flues, and for use where a thin pliable covering is required. A good rust preventive.

Cement

This cement is made of asbestos fiber, magnesia, infusorial earth and other selected ingredients to insure strength and non-conduction of heat.

THE BONNOT COMPANY

Pulverized Coal Systems

CANTON, OHIO

Products

HOLBECK PULVERIZED COAL SYSTEMS.

Also Bonnot Pulverizers, Rotary Kilns, Dryers and Coolers, and Bonnot Clay Working Machinery.

Holbeck Pulverized Coal Systems

THE BONNOT COMPANY, sole licensees in the United States for Holbeck pulverized coal systems, have been successfully installing these systems for seven years. Reference to the diagram below will give considerable information as to the principle of this system.

Pulverized coal, when mixed with the proper amount of air, burns without smoke, not unlike gas; either reducing or oxidizing flames being obtainable. With the Holbeck system the flame is under immediate control of the operator at all times.

The pulverized coal is delivered automatically as required to the different furnaces. After the coal is pulverized and delivered to the pulverized coal storage bins, the only equipment used is a screw conveyor to

feed the coal from the bin, a blower to propel the air and an automatic regulator that works in conjunction with the air indicator to control the speed of the feeder that feeds the pulverized coal into the system.

Holbeck systems have been installed in almost every field of furnace heating, embracing boilers, sheet and pair, annealing and tinning, continuous billet heating, wheel and tire, blooming mills, large forging, forge, rivet heating, plate heating, lead, gold and silver refinery, malleable melting, spring, nut and bolt, reverberatory for copper smelting, rotary kilns, tin smelting, copper casting and many other types of furnaces.

More complete information will be sent to interested parties and the engineers of this company will make estimates of the economy to you in using a Holbeck system.

Bonnot Pulverizers, Rotary Kilns, Bonnot Clay Working Machinery, etc.

Complete information and catalogue will be sent on request.

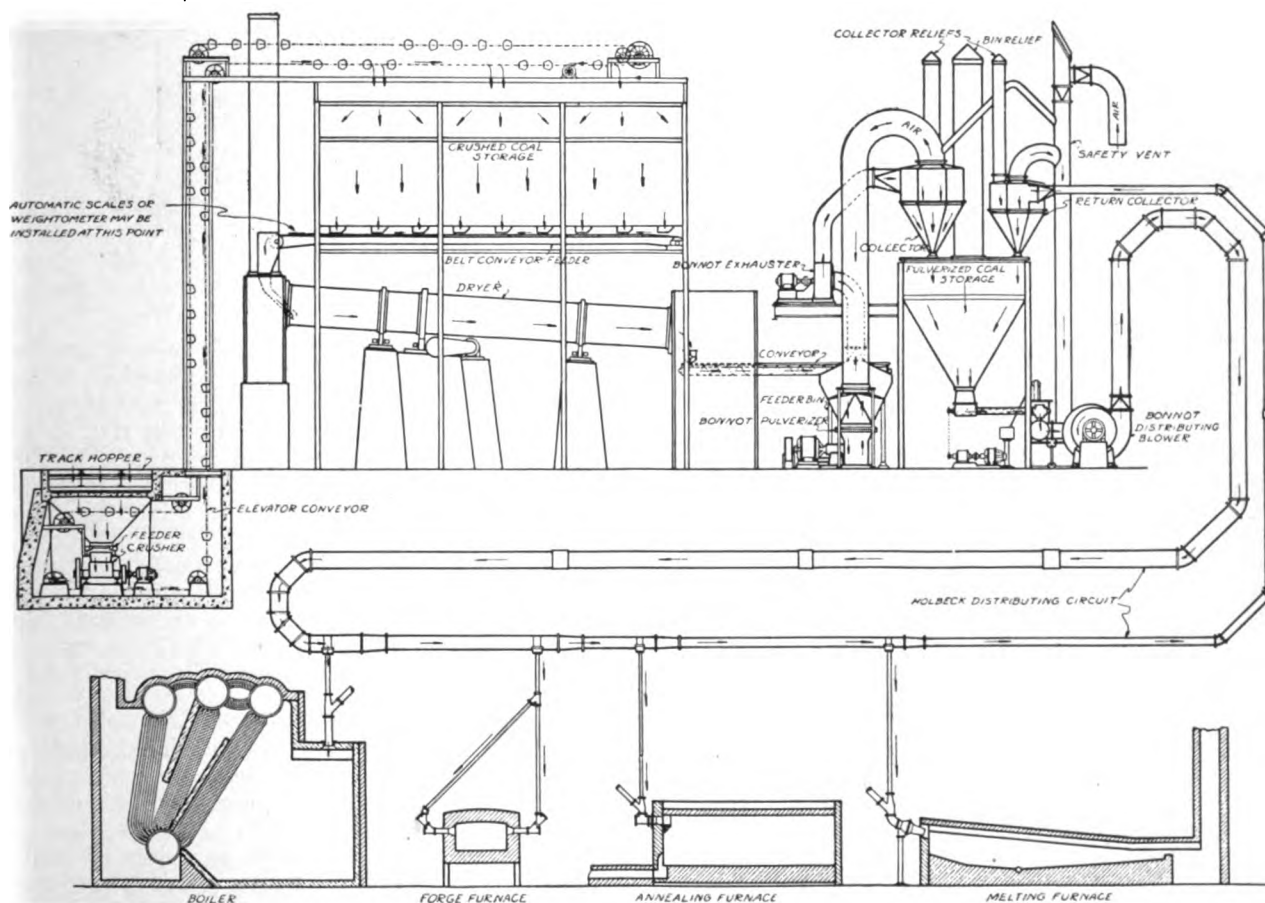


DIAGRAM OF A TYPICAL HOLBECK PULVERIZED COAL SYSTEM

FULLER-LEHIGH COMPANY

Manufacturers of Powdered Coal Equipment

FULLERTON, PA.

BRANCH OFFICES

CHICAGO, ILL., 1336 McCormick Building
NEW YORK, N. Y., 50 Church Street

SEATTLE WASH., 1915 L. C. Smith Building
HAMBURG, GERMANY, "Wallhof," Glockengiesserwall, 2
LONDON, ENGLAND, 25 Victoria Street, Westminster, S. W.

Products

PULVERIZED COAL EQUIPMENT including Pulverizer Mills, Direct and Indirect Fired Rotary Dryers, Pulverized Coal Conveying Systems, Pulverized Coal Feeders and Burners.

Also manufacturers of Roll, Jaw and Gyratory Crushers; Tube Mills and Tube Mill Linings; Ball Mills and Ball Mill Linings; Sprockets; Wire Rope Rollers and Sheaves; Car Wheels and Axles; Cinder Ladles; Gray Iron Castings for all smelting and refining purposes; Furnace Castings; Chemical and Heat Resistant Castings; Evaporating Pans; Mixing Pans; Vacuum Pans; Sulphuric Acid Concentrating Pans; Nitric Acid Retorts; Caustic Soda Pots; Niter Pots; Muriatic Decomposing Pots; Chemical Process Kettles; Lead Refining Kettles; Desilverizing Kettles; Acid Eggs; Anode Molds; Nitric Acid Condensers.

Fuller-Lehigh Pulverized Coal Equipment

We manufacture and install all the various units required to reduce coal from lump to powdered form for heating industrial furnaces.

Our pulverized coal equipment (consisting principally of crushing rolls, pulverizer mills, direct and indirect fired rotary dryers, coal feeders and burners) is installed in plants having a combined capacity of over 35,000 tons of pulverized coal per day. These plants are widely distributed and are pulverizing coal obtained from a large number of fields in various coal producing districts and used for a wide variety of purposes.

Advantages of Fuller-Lehigh Pulverized Coal Burning Equipment

Very high combustion rates are easily maintained with minimum chimney losses. Flexibility of operation equal to that of fuel oil or natural gas.

Troubles due to poor coal are largely overcome. Smokeless operation; no banked fires; no stand-by losses; no clinkers; no slicing, barring or cleaning of fires; no fuel waste. Cuts down labor and increases plant capacity.

Prompt control of the entire firing operation is obtained, a great advantage in case of accident or emergency.

Independence of any particular grade or quality of coal; the cheapest grade of coal can be used.

Can be used in any type of furnace where the ash of the coal can be taken care of; presents less difficulty than with any other method of firing.

Operating cost compares favorably with that of stoker installations in medium size plants and is decidedly less in large central stations. Operation absolutely safe and dependable under all conditions.

The poorer grades of coal are transformed into highly efficient fuels, thereby cutting down coal bills and allowing considerable profit, for the cost of preparation is low compared with the cost of competing fuels.

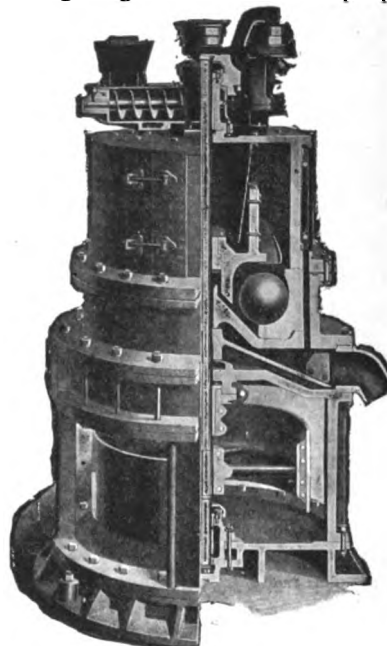
A lower percentage of excess air is required for burning, therefore much higher efficiencies can be readily obtained.

Fuller-Lehigh Pulverizer Mills

Complete, self-contained, single reduction units of rigid construction producing uniformly and finely pulverized coal in one operation.

Fuller mills have uniform feeding devices and constant and free discharge. No outside accessory equipment is required. No inside lubrication; no inside journals or bearings. Operation is dustless. Installation, operating and lubricating costs are low.

Pulverizing element consists of 4 unattached steel balls which roll in a stationary, horizontal, concave shaped grinding ring. The balls are propelled around



FULLER-LEHIGH PULVERIZER MILL

the grinding ring by means of four pushers attached to four equidistant horizontal arms forming a portion of the yoke, which is keyed direct to the mill shaft. The feed falls between the balls and grinding ring in a uniform and continuous stream and is reduced to the required fineness in one operation. Discharge is by means of fans on central shaft above and below the grinding zone.

Made in either fan discharge type (either pulley or gear driven) and in unit mill and separator type (in which the air separating element is an integral part of the mill), both in 24-, 33-, 42- and 57- in. sizes; capacities from $\frac{1}{2}$ to 10 tons per hour.

Indirect Fired Rotary Coal Dryer

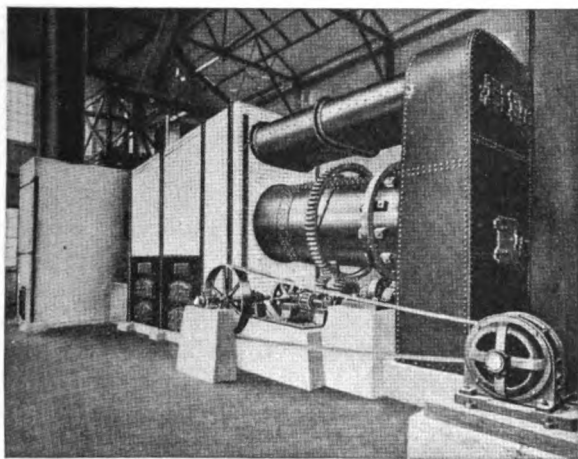
Designed and built by experts who through years of research have determined the most efficient types to produce a maximum drying capacity with minimum amount of fuel used.

Fuller-Lehigh dryers handle any class of coal and accomplish any desired reduction of moisture content (they are successfully handling coals with moisture above 20%).

The Fuller-Lehigh indirect fired rotary coal dryer consists essentially of an axially inclined cylindrical shell fitted with suitable rollers and gearing to permit the shell being rotated on its longitudinal axis.

The moist coal is fed into the dryer shell through a feed spout located in stack chamber. A series of longitudinal shelves fastened to the inside of the dryer shell lifts the coal and drops it through the current of heated air passing through the inside of the dryer shell. The hot gases from the furnace fire circulate around the outside of the dryer shell passing through the combustion chamber of the furnace. They then travel through the horizontal breeching and enter the top of the hood at lower end of the dryer. From here the hot gases flow to the interior of the dryer shell and come in direct contact with the coal in the dryer and thence to the atmosphere through the stack.

Made in various sizes for a wide range of conditions.



FULLER-LEHIGH INDIRECT FIRED ROTARY COAL DRYER

Fuller-Kinyon System for Conveying Pulverized Coal

This system facilitates the conveyance of pulverized coal with the ease, safety and cleanliness of water or oil.

It consists essentially of a helical screw mounted on an extension shaft supported on outboard ring oiled bearings. The arrangement precludes the possibility of pulverized coal wearing into and injuring the bearing metal.

The material is delivered to the feed hopper, where the screw engages it and carries it to the discharge end of the pump. At this point it is aerated with a small volume of low pressure compressed air which fluidizes the coal, and from here it is carried to the point of consumption through standard size pipe varying from 3 to 5 in. in diameter, depending on capacities required.

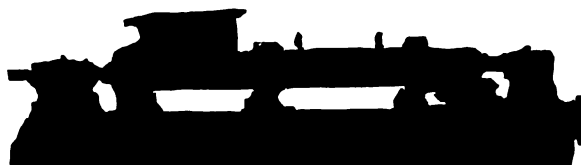
Distribution from the main line to a number of bins is made by means of specially designed diverting valves described elsewhere on this page.

The amount of air used in this system is very small. Initial cost of the system is low; explosions and fires can not occur; power consumed is lower than that required for any other method of conveying; number of wearing parts are reduced to a minimum; there is only one moving element; safe, dustless, flexible and easily applied; cost of installation and operation is low.

Pump for Conveying Pulverized Coal

Uses standard size pipe as a conveyor line which may be run up or down grade making any number of bends.

Simple and economical to install and operate. Its flexibility makes it adaptable to any existing or contemplated plant layout, while absolute dustlessness insures safety and comfort for workmen.

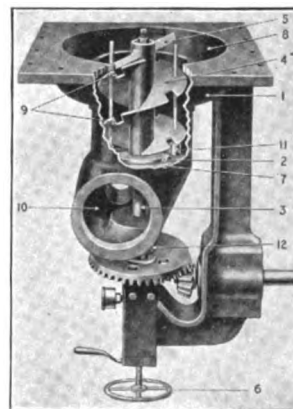


FULLER-KINYON PULVERIZED COAL PUMP

Fuller S-H Pulverized Coal Feeder

A simple and efficient device for uniformly delivering pulverized coal from storage bins to furnace. It is finely adjustable to meet the variable fuel requirements of the furnace through a wide operating range.

Operates at a low constant speed, feed being regulated by raising or lowering the valve. Will not choke or clog in case the primary air flow is shut off. Will not flood, as the upward action of the screw carries away the bulk of the fuel from the air stream and only the coal fed through the notches can be delivered to the burner. In all other types of feeders flooding is an objection, but in Fuller S-H feeders a flooding condition assists in regulating the feed.

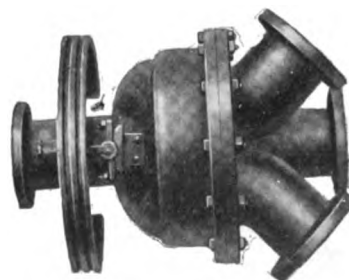


FULLER S-H PULVERIZED COAL FEEDER

Fuller S-K Valve

Designed to divert a flow of pulverized coal under pressure from a main line to a number of branch lines leading to various receiving bins.

Furnished complete with two or more arms on discharge end. Positive in action, effectually seals ports which are supposed to be in closed circuit and allows unobstructed flow of material from main line to port which is in open circuit.



FULLER S-K VALVE

GRINDLE FUEL EQUIPMENT COMPANY

SUBSIDIARY OF WHITING CORPORATION

Complete Powdered Fuel Equipment

15611 Lathrop Avenue

HARVEY, ILL.

(Chicago Suburb)

Products and Service

Complete POWDERED FUEL SYSTEMS for any practical purpose, including:

- Malleable Iron Melting Furnaces
- Gray Iron Melting Furnaces
- Open Hearth Steel Furnaces (acid process)
- Annealing Furnaces, pot and muffle types
- Billet and Bar Heating Furnaces, for rolling and forging
- Forging Furnaces for hammer and press work
- Drying Kilns
- Nodulizing Kilns
- Steam Boilers in industrial and domestic heating plants
- Core Ovens
- Copper Melting Furnaces
- Brass Melting Furnaces
- Ore Sintering Furnaces
- Ore Melting and Reducing Furnaces
- Preheating Furnaces
- Ceramic Kilns
- Brick Kilns
- Powdered Coal Gas Producers
- Steamship and Locomotive Boilers
- Retorts for Chemical Processes
- Distillation and Dehydrating Plants
- Lime Burning and Magnesite Kilns
- Glass Melting Furnaces
- Enameling Furnaces
- Galvanizing and Tinning Tanks

We design, construct and erect, ready for operation. Our experienced engineers are at all times ready to furnish suggestions, estimates and details. Every installa-

tion is guaranteed to operate as claimed. We also design and build various types of furnaces for use with powdered coal.

Economy of Powdered Coal

One of our customers reports a \$7000.00 net saving per year on one 10-ton air furnace fired with Grindle equipment. Another reports a saving of \$29,000.00 on a 26-ton malleable furnace. The savings possible depend on conditions; usually an installation will pay for itself in from one to three years and after that pay big dividends. In the case of metallurgical furnaces, the quality of the product is also very much improved through the use of powdered fuel, while oxidation is materially reduced and big savings effected in furnace repairs, kindling wood, ash disposal, etc.

Special Features

Entire Grindle system is automatically operated and controlled.

Absolutely safe and dustless.

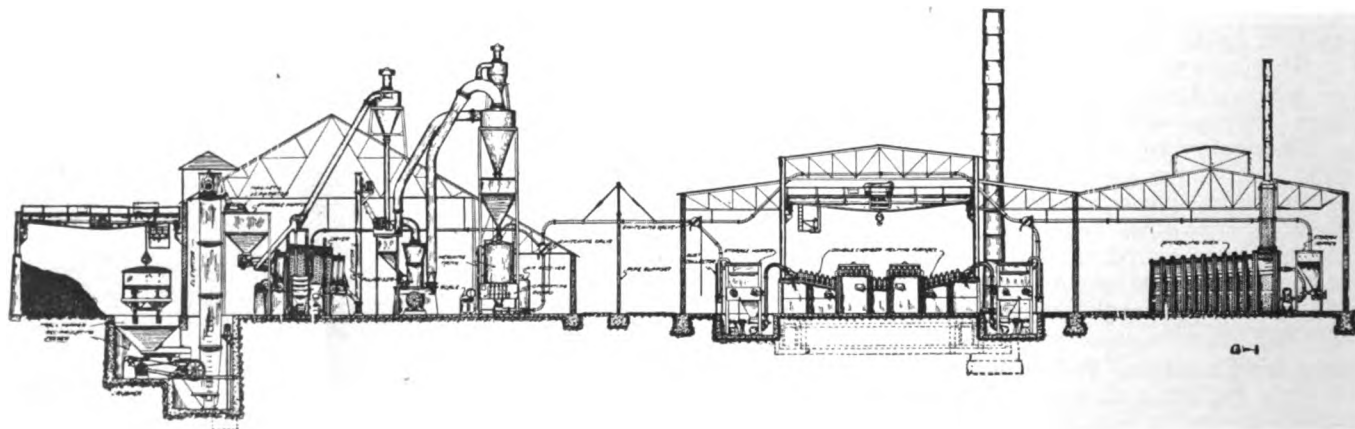
Flexible arrangement, allowing preparation plant to be located at convenient point and powdered coal may be delivered anywhere in plant through small standard pipe.

Specially designed feed screw and burner give uniform feed of coal and thorough carburization.

We guarantee results.

Further Information

For detailed description of the design and operation of a Grindle system, see our General Catalogue, sent on request.



TYPICAL ARRANGEMENT OF GRINDLE POWDERED FUEL SYSTEM

QUIGLEY FUEL SYSTEMS

Complete Pulverized Fuel Plants

OFFICE (HARDINGE COMPANY)

120 Broadway

NEW YORK, N. Y.

Products and Services

Complete equipment required for PULVERIZED FUEL PLANTS: Crushers, Elevators, Bins, Hoppers, Dryers, Pulverizing Mills, Transport Systems, special Dust-tight Valves, Gates, Dust Collectors, Pulverized Fuel Feed Controllers, Burners.

ENGINEERS for Designing and Supervising the Erection of complete Pulverized Fuel Plants.

For Ball and Pebble Mills, see page of Hardinge Company, 864.

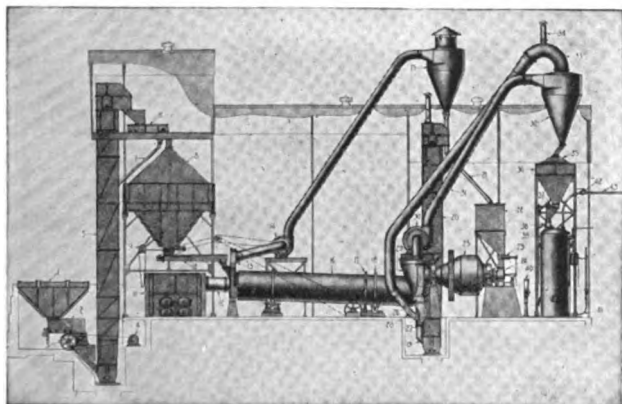
Uses

Annealing furnaces	Ingot furnaces
Bar heating furnaces	Malleable iron smelting furnaces
Bloom and billet furnaces	Open hearth furnaces
Boilers	Ore roasting and smelting furnaces
Busheling and puddling furnaces	Plate and angle heating furnaces
Calcining furnaces	Rotary lime kilns
Cement kilns	Rotary dryers
Continuous heating furnaces	Rod heating
Copper smelting reverberatory furnaces	Sheet and tin plate furnaces
Forging	Sintering furnaces
Galvanizing pots	Soaking pits
Heating and reheating furnaces	Tin pot furnaces

Central Pulverized Fuel Milling Plant

Designed to meet the requirements of each manufacturer, but in general takes coal from the freight car; it is then crushed, dried, pulverized and transported to the point of application and burned in the furnaces. The Quigley compressed air transport system, as patented and developed, is capable of delivering pulverized fuel for distances as far as 3000 ft. through a small diameter wrought iron pipe, without the use of any complicated mechanisms to get out of order. The entire operation is dustless.

QUIGLEY FUEL SYSTEMS employs a method unlike any other—keeping accurate record of the fuel as burned at any one point. This keeps the fuel consumption at a minimum and enables operator to keep a close check on the fuel used. Fuel may be transported to any number of furnaces in different parts of the plant as easily as piping natural gas or oil. Any character of flame desired is obtainable owing to the fine adjustment features of

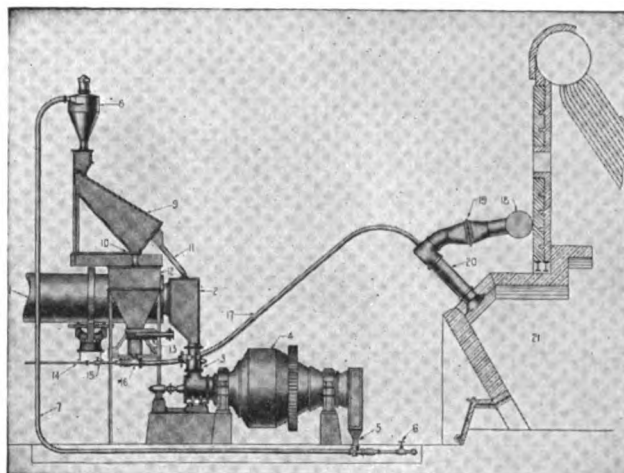


A TYPICAL CENTRAL MILLING PLANT SHOWING SYSTEM FOR PULVERIZING, TRANSPORTING AND BURNING PULVERIZED FUEL

fuel and air supply. Pressure at the furnace is so low that the combustible mixture is in effect "breathed" into the furnace.

Unit Milling Plant

A simple milling plant has been developed to operate in conjunction with one furnace or a group of furnaces in close proximity to each other. Plant is very simple and economical in operation; may be run continuously, as the component parts are strong and capable of withstanding severe treatment. This system may be economically applied to a single boiler of as low as 200 b. h. p. rating.



MILLING PLANT DESIGNED TO OPERATE CONTINUOUSLY AND DELIVER PULVERIZED FUEL DIRECTLY TO FURNACE

Capacities

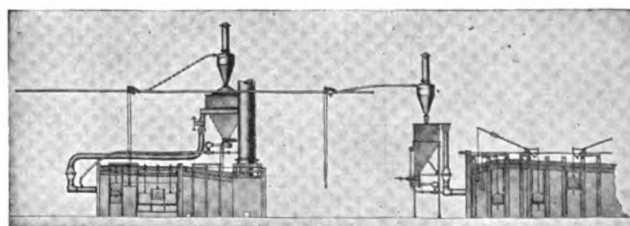
Complete plants are designed to handle capacities ranging from $\frac{1}{4}$ ton per hour upwards. The capacity of the largest plant constructed to date is 30 tons per hour.

Information Required

(1) For what character of burning will the fuel be utilized? (2) Character of fuel to be used. (3) Estimated fuel consumption per hour. (4) Distance of proposed fuel plant from most remote furnace. (5) What system of burning fuel is now used, if any?

Bulletin

Write for Bulletin No. 12.



E. H. STROUD & COMPANY

ESTABLISHED 1896

Engineers and Manufacturers of Crushing, Pulverizing and Stoking Machinery

928, 930, 932 and 934 Fullerton Avenue

CHICAGO, ILL.

Products

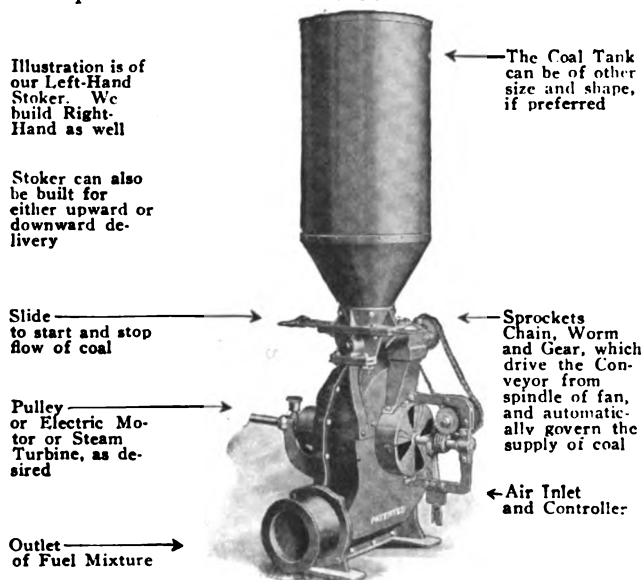
Machinery for the reduction of all sorts of DRY GRINDABLE MATERIALS, ANIMAL, CHEMICAL, MINERAL and VEGETABLE and some that carry 6% to 8% of MOISTURE. Also POWDERED COAL BURNING EQUIPMENT.

Pioneers

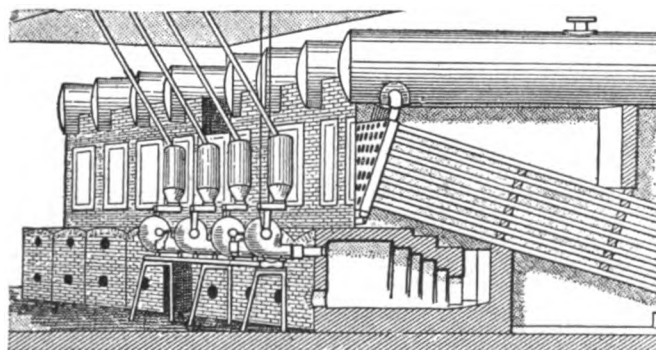
Pioneers in the art of pulverizing, stoking and burning powdered coal under boilers and some other heating units.

Stroud Powdered Coal Stoker and Burner

This device receives the powdered coal, draws its own supply of air from the atmosphere, measures the coal and the air as used, mixes them thoroughly, delivers the mixture to the furnace (where it ignites at once) and enables the operator to have complete control of furnace temperatures and to make records from which to duplicate his results at will.



STROUD POWDERED COAL STOKER AND BURNER



ROUGH SKETCH OF A TYPICAL STROUD POWDERED COAL INSTALLATION

We have purposely made an incorrect drawing of the furnace and some other details because we do not



wish to advertise or give away gratis information which has cost us considerable time and money and effort.

Our installation is as simple as that shown, and gives entire satisfaction.

All persons are warned that the ideas embodied in the "Stroud Powdered Coal Stoker and Burner" are well covered by fundamental patents.

Sizes and Capacities—Sizes and capacities from 15 lbs. to 5000 lbs. of coal per hour per stoker with all the air needed for combustion.

Write for Bulletins A and No. 107.

Stroud Air Separation Pulverizers

The illustration shows a product collector attached to the pulverizer. We build air vent chambers too.

These mills give a finished product direct which, without subsequent sieving, is so uniformly fine that 95% or 98% or all of it, as wanted, will, if tested when dry, pass through a horizontal brass wire cloth testing sieve of the desired mesh, which can be any mesh from say 40x40 down to the most impalpable powders, far finer than a 200x200 mesh.

They are without exception the most efficient pulverizers made.

Dustless in operation.

Difficult to clog.

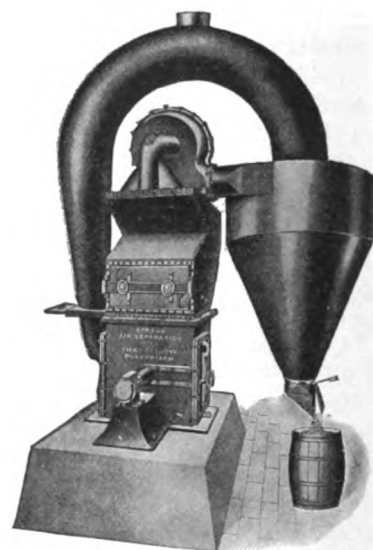
Easy to clean.

A cool pulverizer for chemicals.

So automatic in feeding and operation that one man can attend to at least half a dozen mills.

Cost of milling is very low.

Ask for Bulletin No. 101-A.



STROUD AIR SEPARATION PULVERIZER

Throw-out-Box-End-Door

For cleansing materials from imperfect and foreign matter during process of pulverization.

Ask for Bulletin No. 101-B.

Stroud Screen Separation Crushing and Grinding and Shredding Mills

Ask for Bulletin No. 102-B.

Crushing and Granulating Roller Mills

With either pointed or chisel shaped cutters, or fluted rollers, one pair, two pairs or three pairs of rolls high, per mill.

Ask for Bulletin No. 200.

THE ANTHONY COMPANY

Liquid Fuel Engineers

136 West Avenue
LONG ISLAND CITY, N. Y.

Products

ANTHONY NEBULYTE OIL BURNERS.

ANTHONY NEBULYTE FORGES and FURNACES.

ANTHONY NEBULYTE OIL SPRAYS for gas plants and SPRAYS for all Liquids.

Also manufacturers of Anthony Nebulyte Gas Burners, Combination Oil and Gas Burners, Torches, and Anthony Nebulyte Oil and Gas Burning Equipment for all Industrial Heating Processes.

Engineering Service

THE ANTHONY COMPANY is prepared to design new equipment, and re-design old equipment of any kind, enabling any one to avail himself of the advantages of oil or gas fuel, or both in combination.

The engineering staff is also prepared to discuss all heating problems, and design special oil or gas fired apparatus for specific needs.

Having designed a great variety of successful industrial heat treating systems, Anthony engineers have wide experience in this field to place at a client's disposal.

They are pioneers in the development of mechanical nebulization as applied to the combustion of liquid fuel, as well as in the application of those combustion principles which effect the accurate control of heat quality.

Employment of their services leads to conservation of fuel, speeding up of production, and better quality of output, as 3500 clients will testify.

Anthony Nebulyte Burners and Torches

These devices are applicable wherever forges, furnaces, stills, dryers, boilers, kilns or other apparatus require heat. Low and high pressure designs to suit every requirement. When applied and operated in ac-

cordance with the instructions of THE ANTHONY COMPANY they produce combustion of intensity and quality unequalled.

The development of these devices represents the greatest advance in the science of burning liquid fuel.

Anthony Fuel Equipment

The continuous and successful operation of any fuel system depends on the use of correct equipment, installed and adjusted in accordance with established facts.

Special equipment of approved type for every part of liquid and gas fuel systems supplied.

Anthony Nebulyte Forges and Heat Treating Furnaces

These include rivet forges, crucible furnaces and a general line of heat treating furnaces built to take advantage of the superior operating characteristics of Nebulyte Burners.

Simple, compact, sturdy, non-oxidizing. Portable and stationary.

Low operating cost.

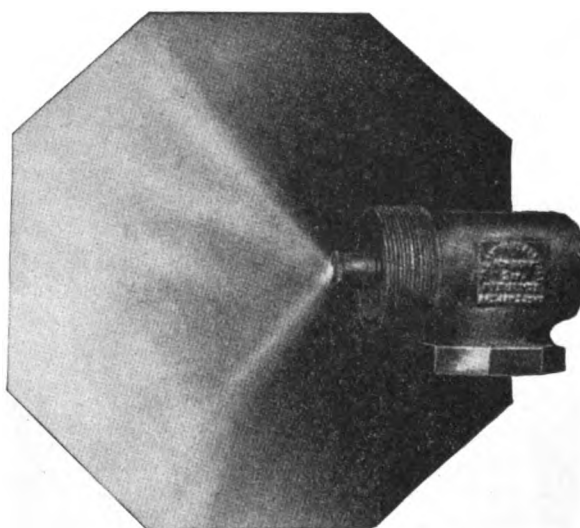
Anthony Nebulyte Sprays for Gas Plants

In the operation of gas plants, Nebulyte Sprays give perfect nebulization, positive control and uniform distribution of oil. No steam or compressed air required.

The standard of up-to-the-minute gas plants.

Anthony Nebulyte Sprays for All Purposes

Sprays supplied of definite capacity and throw which can be utilized for many purposes, such as: cooling, aerating, atomizing, gasifying, mixing, absorbing gases and vapor, and for all purposes where it is desired to distribute a liquid in finely divided form over a large area, or through a large volume.



THE ANTHONY NEBULYTE SPRAY
Note the mist of liquid

BRIGGS ENGINEERING COMPANY

Manufacturers of Fuel Oil Burning Systems

227 Twenty-fourth Street
BROOKLYN, N. Y.

Product

The BURNWELL FUEL OIL BURNING SYSTEM.

Burnwell System

The Burnwell system is a mechanical system of burning fuel oil, by means of which the oil is heated and then forced through an atomizer under pressure into the furnace without the use of compressed air or steam. The system consists of duplicate pumps, strainers and heaters, burners and furnace fronts. It is the result of ten years' successful experience in designing, building, installing and operating mechanical fuel oil burning apparatus, and it combines simplicity of operation with low maintenance cost and high economy.

The Burnwell system can be furnished to meet the requirements of any steam generating plant.

Burners—The oil when forced through the burner or atomizer is given a centrifugal motion and released in the form of a smooth, hollow cone. The burner tips are very simple in design and are easily cleaned. An easily cleaned strainer is fitted in the burner body.

By means of a special safety device, the supply of fuel is automatically shut off when the burner gooseneck is removed from the body for cleaning purposes. This makes the burner foolproof.

Furnace Fronts—The Burnwell combination type of oil firing furnace front is so arranged that the proper proportion of air can be mixed with the fuel oil as it is sprayed from the burner, either by forced draft or natural draft. The supply of air can be regulated accurately.

The furnace front is fitted with a swinging door which gives easy access to the interior of the furnace.

Special fronts can be supplied to fulfill particular needs when the combination type does not meet all requirements.

Strainers—The Burnwell system includes two duplex strainers, a low pressure suction strainer in the suc-

tion line leading to the oil pumps and a high pressure discharge strainer in the oil line leading to the burners. These strainers have an exceptionally large straining area and are quickly and easily cleaned.

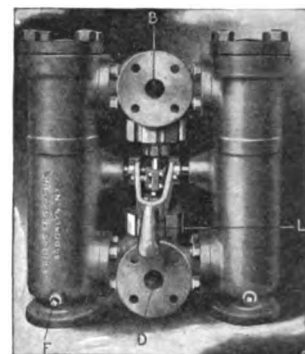
An easily operating lever working up and down changes the flow of oil from one side of the strainer to the other.

Heaters—Burnwell oil heaters are of the eight-pass, straight tube type. Oil is heated gradually and thoroughly to the desired temperature by means of steam which passes around the tubes. Care has been taken to see that the oil is not heated too rapidly in order to avoid splitting the oil up and thereby clogging the heater.

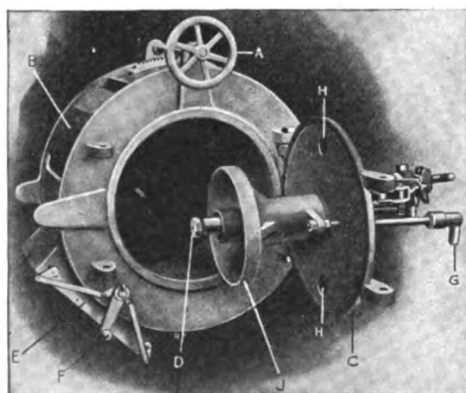
Air Chamber—An air chamber is fitted in the oil line from the pumps to the burners to take up the pulsations of the pumps, thus insuring a steady flame at the burners.

Burnwell Assembled Units

Burnwell systems are usually furnished with the pumps, heaters, strainers and air chamber suitably mounted, piped and assembled on a base. This insures having the system correctly piped and assembled with the proper size and type of fittings. It is then only necessary to connect the suction strainer to the oil supply line and the discharge strainer to the line leading to the burners. If desired, our engineers will install the system and assist in putting the plant in operation.

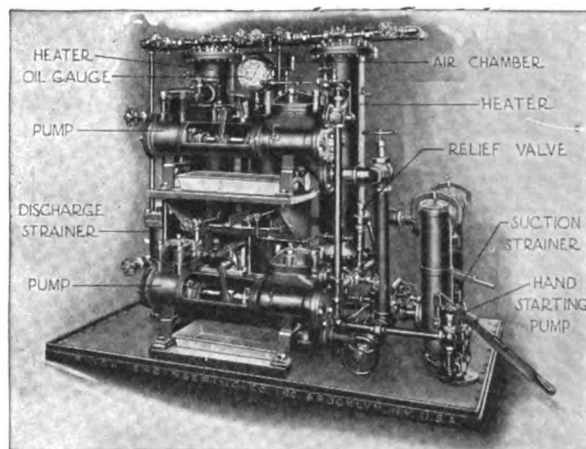


DUPLEX STRAINER
B—Oil inlet. D—Oil outlet. F—
Draining plug. L—Oper-
ating lever



BURNWELL FURNACE FRONT

- | | |
|---|---|
| A—Handwheel for operating slide for natural air draft | F—Air nozzle damper regulating lever |
| B—Air regulation slide partly open | G—Handles for operating adjustable air cone |
| C—Swinging door | H—Heavy glass eye-sights |
| D—Atomizing nozzle | J—Adjustable air cone |
| E—Air nozzle for forced draft | |



BURNWELL ASSEMBLED UNIT

Briggs Service

Our combustion engineers will gladly assist, without obligation, in planning an efficient fuel oil burning system for your steam generating plant.

Our booklet, "Advantages of Oil as Fuel over Coal," will be sent on request.

THE ENGINEER COMPANY

Manufacturers of Enco Oil Burning Equipment, Baffle Walls and Automatic Combustion Control

17 Battery Place
NEW YORK, N. Y.

BRANCH OFFICES

ATLANTA, GA., Trust Co. of Georgia Building
BOSTON, MASS., 10 High Street
CHICAGO, ILL., 1414 South Michigan Avenue
CLEVELAND, OHIO, 515 National City Building
DETROIT, MICH., 4610 Woodward Avenue
INDIANAPOLIS, IND., 316 Indiana Trust Building
MILWAUKEE, WIS., 614 Security Building

MINNEAPOLIS, MINN., Builders Exchange Building
MONTREAL, QUE., Coristine Building
NEW ORLEANS, LA., 847 Baronne Street
PHILADELPHIA, PA., 1010 Harrison Building
PITTSBURGH, PA., Jenkins Arcade Building
ST. LOUIS, MO., 701 Pontiac Building
WILKES-BARRE, PA., 21 Bennett Building

Products

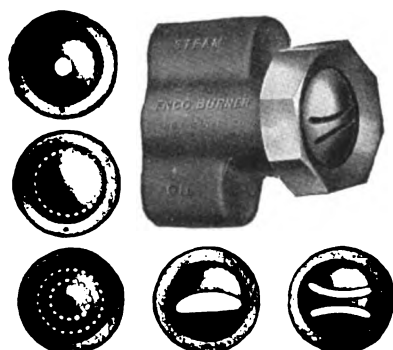
ENCO EQUIPMENT for FIRING, ATOMIZING and BURNING OIL; TURNER INCLINED BAFFLE WALLS; BALANCED DRAFT COMBUSTION REGULATING EQUIPMENT.

Enco Oil Burner

The Enco Steam Atomizer, by utilizing an entirely new application of a simple and well-known principle, has shown results in operation which are little short of amazing.

Its two most important advantages are: (1) a faculty for burning low gravity oil, in both large and small quantities, with minimum oil and steam or air pressures; (2) the ability to produce a flame of any size or shape.

Atomization is entirely completed within the burner and, as neither the size nor shape of the flame plate outlet plays any part in the atomization, it is possible to shape and arrange the flame plate openings to obtain



THE ENCO STEAM ATOMIZER, TYPE 400, AND FIVE STANDARD FLAME-SHAPING PLATES (Nos. 1, 3, 4, 5 AND 6)

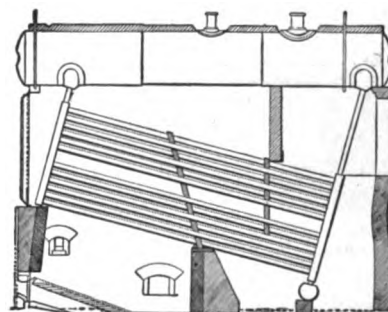
a flame of any characteristic desired. Enco Steam Atomizers are therefore not limited to use with checker work, but can be mounted in air registers of the type used with mechanical atomizers, developing higher efficiency with lower pressures and permitting far greater flexibility. The Enco Mechanical Atomizer embodies many improvements over previous types from the standpoint of simplicity and economy as well as efficiency.

Other Enco Oil Firing Equipment comprises the Enco Air Register for use with either the steam or mechanical atomizer, the Enco Simplex and Duplex Oil Strainers and the Enco Oil Heater. Let us send our booklet describing completely the development and application of Enco Burners.

Turner Baffle Walls

Turner Baffle Walls, unlike poured walls, are *built* into place. They stay tight. They can be set at any angle to the tubes, a feature of construction which permits the correct engineering solution of many combustion problems which cannot be solved by any other means.

By building Turner Baffle Walls at the correct angle, heating surfaces can be increased, dead spaces eliminated, slag formation reduced, soot and cinder nuisance done away with. High stack temperature, incorrect drafts and reflected heat can be overcome. The illustration shows how Turner Baffle Walls can be built at any angle.



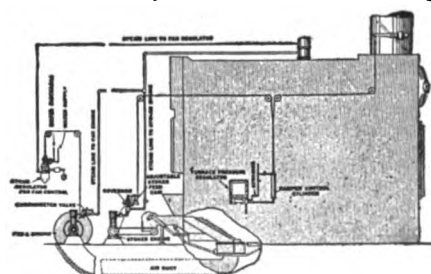
TURNER BAFFLE WALL INSTALLED

Let us send "The Development of an Idea." It is a book full of interesting information and examples which indicate how this scientific baffle wall can end boiler troubles.

Balanced Draft

Balanced Draft is a system of better combustion control, utilizing over-grate furnace pressure as the source of control for each individual boiler. It saves fuel and increases boiler efficiency by admission of just the correct amount of air and the proper removal of waste gases. When stokers are used it supplies the correct amount of fuel for the individual combustion requirements of each furnace. Balanced Draft can be used with any kind of fuel, including coal, coke, breeze,

oil and gas. It can be installed as a part of any present plant without disturbing sidewalls or setting. "Modern Practice in Combustion Control" gives a full description of its operation. Copy sent on request.



BALANCED DRAFT, SHOWING STEAM CONTROL OF FAN AND FURNACE PRESSURE CONTROL OF FLUE DAMPER AND STOKER

HAUCK MANUFACTURING COMPANY

Manufacturers of Oil Burning Equipment

137 Tenth Street
BROOKLYN, N. Y.

Products

TORCHES of all sizes for heating and repair work in foundries, boiler shops, machine and auto repair shops, pipe and coppersmith shops, welding shops and power-houses.

FURNACE BURNERS, THAWING OUTFITS, CONCRETE HEATERS, ASPHALT SURFACE HEATERS.

Also manufacturers of Forges for rivet heating, blacksmithing, brazing, etc.; Furnaces for melting lead and babbitt; Preheaters for use in connection with oxy-acetylene welding, etc.

Hauck Welded Steel Kerosene Hand Torches

Produce an intense reddish blue flame without smoke or soot. The solid cast bronze burner is constructed with straight oil passageways. No coils. Easily cleaned. Made in four sizes.

Recommended for straightening, bending, brazing, light blacksmithing, annealing, tempering, hardening. Write for bulletin No. 112.



WELDED STEEL KEROSENE
HAND TORCH

WELDED STEEL KEROSENE
HAND TORCHES

No.	Capacity, gals.	Oil consumed, qts., per hr.	Length full flame, in.
10	$\frac{1}{4}$	1	8
14	$\frac{1}{2}$	2	13
15	1	2½	15
16	1½	3	18

Hauck High Pressure Furnace Burners

For furnaces and forges. Burns distillate, kerosene, fuel oil or crude oil in connection with compressed air or steam at pressures from 20 to 100 lbs. No smoke, soot or carbon. Oil may be fed by gravity or under pressure. Made in six sizes. Write for bulletin No. 119.

HIGH PRESSURE FURNACE
BURNERS

No.	Oil consumed, gals. per hr.	Air consumed, cu. ft. (or steam) per min.
1F	10-25	20
2F	6-10	15
4F	3-6	12
5F	1-3	8
6F	1½	5
25F	¾	2



HIGH PRESSURE FURNACE
BURNER

Hauck Concrete Heaters

For heating concrete in the mixer. Makes placing of concrete in winter just as safe as in summer.

Made in various sizes. Two types—hand pump and compressed air or steam. Write for bulletin No. 130.

Hauck Asphalt Surface Heaters

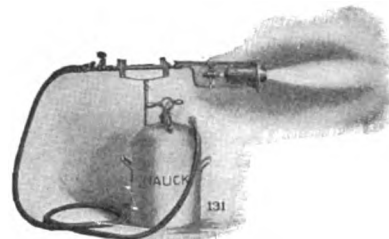
For asphalt patching and resurfacing. Quickest and most reliable method for doing this work. Used by leading municipalities and street contractors. Write for bulletin No. 113.

Hauck Hand Pump Vaporizing Type Equipment

Must be preheated before starting. Recommended where compressed air is not available. Heavy brass

pump in tank for generating pressure on the oil. Made in five sizes.

Unexcelled for preheating in connection with welding; brazing broken machine parts and castings; straightening axles, chassis, frames, shafting, buckled plates, girders, etc.; bending pipe, rails, beams, etc. Write for bulletin No. 112.



HAND PUMP VAPORIZING TYPE
EQUIPMENT

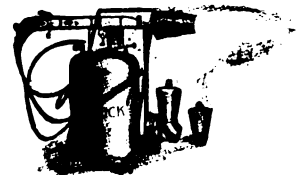
HAND PUMP VAPORIZING TYPE EQUIPMENT

No.	Tank capacity, gals.	Length of hose, ft.	Oil consumed, gals. per hr.	Length full flame, in.	Shipping weight, lbs.
11	3	6	$\frac{1}{2}$	18	50
7a	5	6	1	20	60
7	10	12	1½	22	80
8	12	12	2½	28	95
9	15	12	3	34	110

Hauck Compressed Air Type Equipment

Burns crude oil, kerosene oil, fuel oil or distillate with compressed air at 20 to 100 lbs. pressure. Lights instantly without preheating. No carbonization. Made in five sizes.

Used for the same purposes as the Hauck hand pump type equipment. Write for bulletin No. 112.



COMPRESSED AIR TYPE
EQUIPMENT

COMPRESSED AIR TYPE EQUIPMENT

No.	Tank capacity, gals.	Oil consumed, gals. per hr.	Air consumed, cu. ft. free air per min.	Shipping weight, lbs.	Weight of burner, lbs.	Length, normal flame, in.
5A	5	1	5	55	8	18
5	10	2	8	75	8	22
4	12	3	12	85	13	28
2	15	4	15	100	16	30
1	16	5	20	110	19	48

Note: Length of one section of oil and air hose is 12 ft. each.

Hauck Thawing Outfits

Used by many industrial plants, railroads and public utilities for thawing coal in hopper cars; thawing water pipes, switches; removing ice and snow from materials; etc. The speediest and most economical method of doing this work. Write for bulletin No. 117.



THAWING COAL IN HOPPER CAR WITH HAUCK THAWING OUTFIT

WHITE FUEL OIL ENGINEERING CORP.

Manufacturers of Fuel Oil Burning Systems

742 East 12th Street
NEW YORK, N. Y.

Products

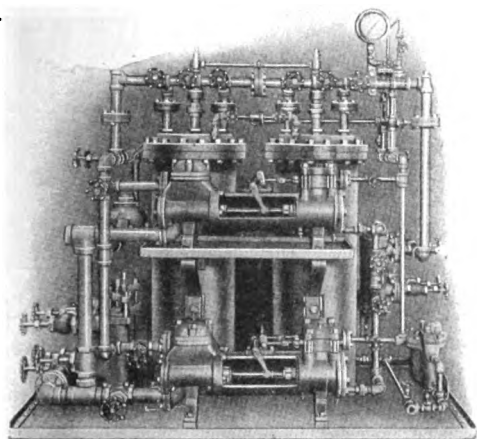
TODD MECHANICAL OIL BURNING SYSTEM.
WHITE MECHANICAL OIL BURNING SYSTEM.
TODD STEAM ATOMIZING OIL BURNING SYSTEM.

Todd and White Oil Burning Systems

Our systems are the result of many years of successful experience in the burning of fuel oil. They are reliable, simple in design, flexible in operation under varying conditions, and all parts are readily accessible for cleaning, inspection and repairs. Complete and efficient combustion of the oil is secured by atomization, and the addition of the proper amount of air in such a way that the air and oil are thoroughly mixed.

Burners are designed to properly atomize the oil, and the proper amount of air is provided by means of patent furnace fronts and an extremely simple arrangement of air regulating cones.

In addition to the burners and furnace fronts, the systems include the heating, pumping and straining units. All parts of this unit are duplex, and are connected so that any part can be cleaned, inspected or repaired while the system continues in operation.



OIL HEATING, PUMPING AND STRAINING UNIT

The systems burn any oil and are obtaining, in every day practise, evaporations of 16 lbs. of water from and at 212° Fahr. per pound of oil burned and boiler efficiencies of 80% to 85%.

Alteration of most boilers from coal to oil burning is extremely simple.

Heaters and Strainers—The heater consists of two coils within a cylinder. The oil passes through the coils which are surrounded by steam.

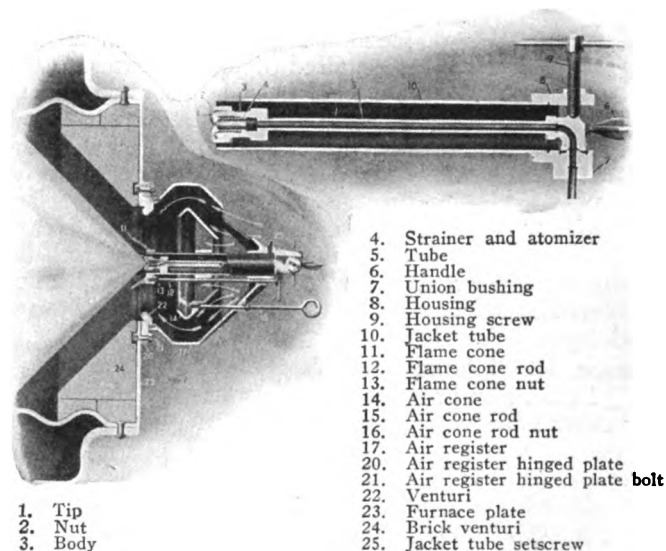
The strainers conform with the most rigid requirements and combine compactness with efficiency. They are usually duplex, allowing one strainer basket to be cleaned while the other is in service.

Mechanical Oil Burning Systems

In our mechanical systems the atomization is secured by forcing heated oil, under moderate pressure, through a specially designed burner. By its mechanical construction alone the burner pulverizes the oil, so that it issues

from the burner tip in the form of a hollow cone-shaped mist completely surrounded by air. The burners are designed to operate at from 80 to 100 lbs. pressure.

Todd Mechanical Burner and Furnace Front—Designed to give an exceptionally wide range of adjustment of the air and oil control as well as to eliminate direct radiation into the fire room. Burner tip and combined atomizer and strainer are assembled as a unit and are readily accessible for cleaning or renewal. Air



TODD MECHANICAL BURNER AND FURNACE FRONT

cone adjustment permits of variation of the volume of air entering the furnace to suit any fire.

The complete front is hinged, giving access to the furnace and to the burner assembly. Burner connection to oil supply manifold is flexible and will stand pressure of 1000 lbs. per sq. in.

White Burner and Furnace Front—The burner is of simple but rigid construction. Grooves within the burner impart a whirling motion to the oil. A strainer is fitted in the burner head. Burners and tips are readily interchangeable. White furnace fronts pre-heat the air used for combustion. This is done by means of radial heating vanes over which all the air passes.

Steam Atomizing Oil Burning System

In the Todd system the oil is atomized by means of steam, or compressed air, the oil being supplied under low pressure. All parts are standardized and readily interchangeable. The Todd steam burner has a wide range of adjustment and operates with equal efficiency under all varying load conditions, and is used extensively for stationary plants of every description, locomotive boilers, refining stills, etc.

Service

Our engineers will gladly give information and advice on any fuel oil burning problems.

Our booklet, "Fuel Oil Burning," containing valuable information and data on the burning of fuel oil, will be sent on request.

SCHUTTE & KOERTING COMPANY

1149 Thompson Street
PHILADELPHIA, PA.

BRANCH OFFICES

BOSTON, MASS.
NEW YORK, N. Y.
PITTSBURGH, PA.

CLEVELAND, OHIO
CHICAGO, ILL.
ST. LOUIS, MO.

KANSAS CITY, KAN.
OMAHA, NEB.
MINNEAPOLIS, MINN.

DENVER, COLO.
TULSA, OKLA.
DALLAS, TEX.

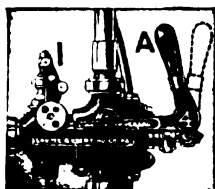
SEATTLE, WASH.
PORTLAND, ORE.
SAN FRANCISCO, CAL.

NEW ORLEANS, LA.
BIRMINGHAM, ALA.
CHARLOTTE, N. C.

Products

STEAM, WATER and AIR OPERATED JET APPARATUS; CHEMICAL EQUIPMENT for handling Liquids and Gases; STEAM CONDENSING and SPRAY COOLING EQUIPMENT; VALVES: Condenser, Check, Reducing, Trip and Throttle, of iron, steel, bronze and lead; HEAT TRANSFER APPARATUS; OIL FIRING SYSTEMS.

Koerting Universal Double Tube Injectors



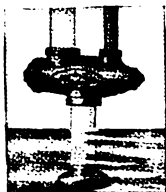
DOUBLE TUBE
INJECTOR

These injectors meet the highest requirements in industrial boiler feeding, and will perform all that is required of jet apparatus. Only one lever need be operated and no adjustments are required. Will take up water at 150° Fahr. and deliver it into boiler at a temperature near the boiling point. Used extensively for over 40 years. Made in iron pipe sizes $\frac{1}{4}$ to 4 in., inclusive, screwed or flanged connections. Capacities, 100 to 12,500 gals. per hour under various pressures. Catalogue 1-A.

inclusive, screwed or flanged connections. Capacities, 100 to 12,500 gals. per hour under various pressures. Catalogue 1-A.

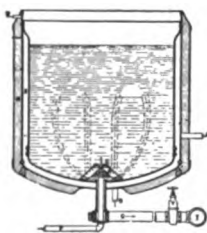
Steam Jet Siphons and Water Jet Eductors

Brass, iron or lead. Handle water or other liquids by means of steam or pressure water. No moving parts. Positive action. Useful in transferring liquids, bilge pumping, emptying tanks or pits, etc. Sizes, $\frac{1}{2}$ to 12 in. Capacities, 200 to 100,000 gals. per hour.



STEAM JET
SIPHON

Automatic Siphon and Eductor—Automatically operated by ball float. Sizes, $\frac{3}{4}$ to 6 in., inclusive. Capacities, 250 to 30,000 gals. per hour. Catalogues 2-A and 2-M.



NOISELESS HEATER

Noiseless Heaters

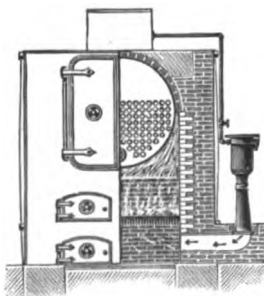
Brass, iron or lead. For open tank heating of water or liquids by steam. Quick and uniform heating due to rapid condensation and positive circulating action. Recommended for general water heating, yarn tanks, dye vats, sugar plants, etc. Sizes, $\frac{1}{4}$ to 6 in.

Also continuous heaters for instantaneous heating by direct connection to steam and liquid pipes. Catalogue 3-A.

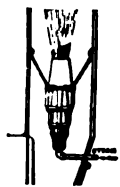
Steam Jet Blowers

With or without spindle regulation. Handle air or gases. For undergrate blowing, chamber ventilating, gas producers, etc. Permit use of low grade fuel. Useful for peak loads. Large capacities. Reliable in service. Low steam consumption. Sizes, 3 to 24 in. Capacities, 10,000 to 1,000,000 cu. ft. per hour. Catalogue 4-A.

Also lead type for chemical fumes. Catalogue 4-K.



STEAM JET BLOWER



STEAM JET
VENTILATOR

Steam Jet Ventilators

Produce induced draft in boiler stacks, cooking kettle uptakes, etc. Simple, sturdy construction. Easy to install and operate. Sizes, $\frac{3}{8}$ to 2 $\frac{1}{2}$ in. for stacks up to 8 ft. in diam. Catalogue 4-B.

Also furnished in lead for handling acid vapors. Catalogue 4-K.

Steam Jet and Water Jet Exhausters

Produce high vacuum. Steam jet has spindle control. Recommended for pump or siphon priming, evacuation of closed vessels, agitation of liquids and compression of low pressure steam, air or gas. Useful as vacuum pumps on condensers, vacuum pans, stills, etc. Steam jet, $\frac{1}{4}$ to 8 in.; capacities, 100 to 60,000 cu. ft. per hour.

Water jet, $\frac{1}{4}$ to 2 $\frac{1}{2}$ in. Catalogues 4-E and 4-P.

Also in lead for chemical service. Catalogue 4-K.



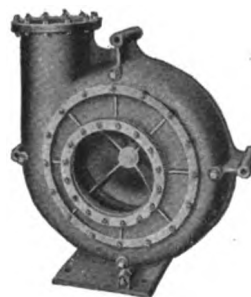
STEAM JET
EXHAUSTER

Automatic Blow Case

For lifting liquids by compressed air. Replaces pumps for chemical service. Complete outfit includes automatic air device, blow case and check valve. Furnished in lead or iron. Reliable, positive and automatic. Gives more satisfactory results than hand controlled air. Three sizes, 8, 15 and 30 tons per hour. Catalogue 7-B.



AUTOMATIC BLOW
CASE



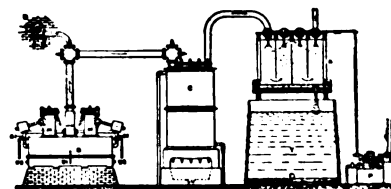
ROTARY LEAD FAN

Rotary Lead Fan

Constructed of hard lead. For handling large quantities of acid fumes. Careful design insures satisfactory service and low power consumption. Belt or motor drive. Side inlet. Discharge horizontal or vertical. 8 sizes. Catalogue 7-L.

Sulphur Furnace

For burning sulphur in the production of sulphurous acid. All cast iron construction of furnace eliminates brickwork. Simple to operate and clean. Water cooled. Induced or forced draft. Outfit includes lead cooler for sulphur gases and absorption chamber spraying set. 6 sizes. Capacities, 12 to 100 lbs. per hour, producing 1800 to 15,000 cu. ft. gas per hour. Catalogue 7-S.



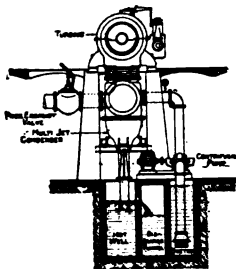
SULPHUR FURNACE

Jet Condensers

Maintain high vacuum without a separate air pump. Water is supplied at 9 lbs. pressure. Steam is condensed and air and non-condensable gases entrained by water jets, the condensers discharging through a short tail pipe into hot well directly below. No moving parts; low power consumption; troubleproof operation. For condensing service in connection with engines, turbines, evaporators, vacuum pans, digestors, dryers, etc.

Eductor Condenser (Single Jet Type)—Recommended for small steam units up to about 200 h.p.; water inlet on top, steam inlet on side. Sizes, 1½- to 10-in. exhaust steam inlet; furnished complete with free exhaust valve, water check valve and basket strainers.

Multijet Condenser—Has top and side steam inlets, either of which can be used. This feature increases the adaptability of this condenser to local conditions of space, water levels, etc. Water inlet on side. Equipped with automatic float vacuum breakers. Built in 40 standard sizes; capacities, 100 to 10,000 kw.; single condensers up to 5,000 kw.; twin units for larger capacities. Catalogue 5-AB.



MULTIJET CONDENSER
INSTALLATION

Condenser Valves

Automatic Free Exhaust Valves—For atmospheric relief lines. Cast iron body, bronze mounted. Globe, angle and vertical types. Sizes, 3 to 36 in.

Balanced Water Check Valves—For protection of exhaust lines. Recommended especially for engine service. Disc suspended on links, giving easy parallel motion. Cast iron body, bronze mounted. Sizes, 3 to 30 in. Catalogue 8-E.



Spray Nozzles

Spiral Types—Brass, iron, steel, lead or porcelain; produce fine atomization of liquids at pressures from 15 lbs. up. For cooling, moistening, washing, absorbing obnoxious vapors or precipitating dust. Large capacities. Sizes, ⅛ to 3 in. Catalogues 6-A and 6-C.

Re-cooling Type—Brass and iron. Handle water from condensers, engine jackets, blast furnaces or any other heating equipment.

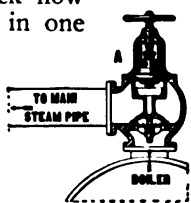
Large capacities; low power consumption. Fine atomization of water produces efficient cooling. Sizes, 1 to 3 in. Capacities, 13 to 150 gals. per minute per nozzle. Distributing systems of cast iron pipe with nozzles on centerpieces, or steel pipe with welded nozzle outlets. Catalogue 5-N.



RE-COOLING NOZZLES

Non-return Stop Check Valves

For use on boilers to prevent back flow from main steam pipe when pressure in one boiler drops. These valves prevent loss of steam and constantly equalize pressures. Cast iron, bronze mounted; cast steel, nickel bronze mounted; or cast steel, monel mounted. Extra heavy bodies permit cast iron type to be used for saturated steam up to 200 lbs. pres-

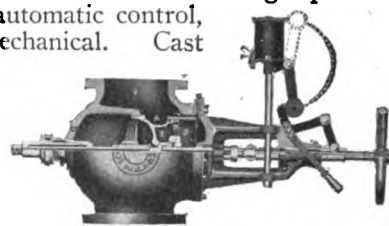


NON-RETURN STOP
CHECK VALVE

sure. Sizes, 2½ to 12 in. Angle or globe pattern. Catalogue 8-B.

Trip and Throttle Valves

For engine and turbine service. Design permits hand operation; also automatic control, either electrical or mechanical. Cast



TRIP AND THROTTLE VALVE

Reducing Valves

Auld Company type. Provides means of reducing pressure on steam lines, giving constant outlet pressure, irrespective of variation or fluctuation of boiler pressure or low pressure consumption. Simple in construction, having outside adjusting spring. Brass, cast iron and steel body. Sizes, ½ to 6 in. Catalogue 8-R.



REDUCING
VALVE

Feed Water Heaters

Tubular type; minimum space and weight; maximum heat transfer. Tube bundle removable for inspection. Floating head allows for expansion. 20 standard sizes. Capacities, 5000 to 500,000 lbs. per hour. Catalogue 10-F.

Evaporators

For marine and stationary service, to supply fresh water for drinking, cooking, washing and boiler feed make-up or any other use where distilled water is required. This distilled water is produced by the vaporization of sea or raw water by means of the condensation of steam in tubes surrounded by the water to be evaporated. Eliminates boiler scale, increasing heat transfer, and saving in fuel. Decreases expense for boiler cleaning and tube replacements. 9 standard sizes. Capacities, 4 to 40 tons per 24 hours. Catalogue 10-DE.



EVAPORATOR

Oil Coolers

For cooling oil from turbine bearings, reduction gears, quenching tanks, transformers, etc. Tubular construction. Cooling

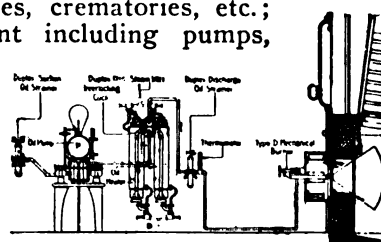


OIL COOLER

medium (water or oil) passes through tubes. Cast iron shell; brass or copper tubes. 45 standard sizes. Capacities, 5 to 500 gals. per minute. Catalogue 12-C.

Oil Burning Systems

For marine and stationary oil burning under boilers, furnaces, crematories, etc.; complete equipment including pumps, heaters, strainers, air registers and burners. 6 different types, depending on oil feed and air regulation. Capacities, 1 to 60 gals. per hour. Catalogue 16-0.



S & K OIL BURNING SYSTEM

JULIAN D'ESTE COMPANY

Manufacturers of Engineering Specialties

26 Canal Street
BOSTON (14), MASS.

NEW YORK, N. Y., 180 Washington Street

CHICAGO, ILL., 318 W. Washington Street

Products

CURTIS ENGINEERING SPECIALTIES, which include:
REGULATORS: Damper, Temperature, Water, Air, Steam, Pump, Fan Engine and Steering Engine.

TRAPS: Balanced and Bucket.

BALANCED LEVER VALVES; U. S. BALL COCKS.

Also manufacturers of Return and Expansion Traps, Blower Valves.

Curtis Improved Damper Regulator

The regulator is actuated by steam pressure and consists of a gunmetal cylinder, within which is a piston fitted with water packing. The piston rod is connected by a chain to the lever of the damper, on which hangs a weight sufficient to overhaul the piston and open the damper, regardless of any ordinary friction.

When the rising pressure reaches the point of lifting the given load, it permits steam to enter the space over the piston, which slowly pushes it down and closes the damper. Falling pressure at length closes the valve, pressure then passing from top to bottom of the piston, which allows the weight to settle and open the damper.

This regulator is guaranteed to change the damper in either direction on a minimum variation of pressure. It is also a guaranteed fuel saver over the best hand regulation.



CURTIS IMPROVED DAMPER REGULATOR

Apparatus includes Regulator, Pulleys, Chain, Weights, and Screws.

No. 1 up to 40-in. diameter damper.

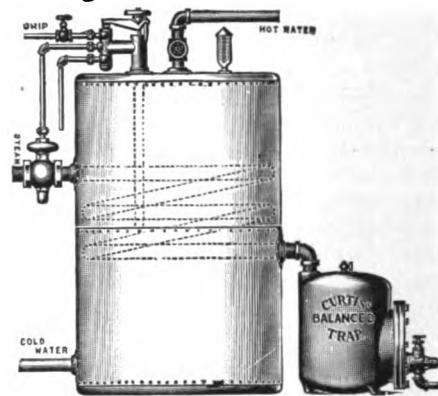
No. 2 up to 60-in. diameter damper.

No. 3 up to 72-in. diameter damper.

Curtis Temperature Regulator

Will control any temperature from 0° to 300°. Easily adapted to steam or hot water boilers, or to tanks for heating water for hotels, baths, or restaurants. A minimum change of temperature produces sufficient movement to do the work. Power is unlimited.

Sizes from 1 to 8 in.



CURTIS TEMPERATURE REGULATOR

Curtis Water Pressure Regulator

For pulp and paper mills, hotels, public buildings, and residences. Warranted to maintain the pressure desired, with perfect uniformity, in spite of any and all fluctuations in the outside pressure. This regulator obviates the wear and tear caused by waterhammer and high pressure on all plumbing fixtures and fittings.

WATER PRESSURE REGULATOR

Size, in.	½	¾	1	1½	2
Height over all, in.	14½	15	15	15½	15½
Diam. diaphragm, in.	7½	7½	7½	7½	7½
Face to face, in.	4¾	5¾	5¾	6¾	6¾
Diam. flanges, in.	•	•	•	•	•
Net weight, lbs.	18	21½	21½	22½	22½

*Screwed.

Size, in.	2½	3	4	5	6
Height over all, in.	17	17½	24	27	29
Diam. diaphragm, in.	7½	7½	7½	7½	7½
Face to face, in.	7½	10	11¾	13½	15
Diam. flanges, in.	•	7½	9	10	11
Net weight, lbs.	34¾	57	110	175	200

*Screwed.



WATER PRESSURE REGULATOR

Balanced Lever Valve

This valve is designed to be used in connection with steam, water, air or gas, and especially with various mechanisms for the automatic control of the supply to engines, pumps, tanks, receivers, etc. It can be used for any purpose to which a balanced valve is adapted.



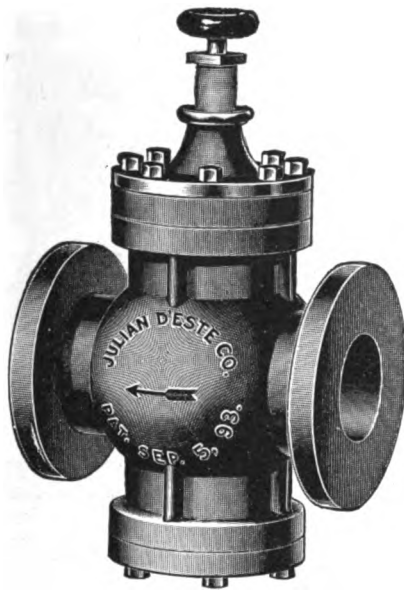
BALANCED LEVER VALVE

½ to 1½ in. inclusive; all-bronze; screwed, angle or globe.
1½ and 2 in.; flanged, angle or globe; cast iron with bronze mountings.
2½ to 12 in. inclusive; flanged, globe only; cast iron with bronze mountings

Improved Steam Pressure Regulator

Made entirely of metal; a lock valve and very sensitive. It has no levers, weights, projections, glands or packing. There is no drip or leak of steam or water, and all that passes into it passes through it. Suitable for boiler pressures up to 200 lbs.

For hydraulic and air pressure an adaptation of the steam pressure regulator is used for the peculiar requirements of a pump pressure regulator. This is accomplished by connecting the chamber under the diaphragm to the pipe or tank in which the water pressure is to be controlled, so that any change of pressure in the pipe or tank operates on the diaphragm and closes, or opens, the valve placed in the steam pipe of the pump.



IMPROVED STEAM PRESSURE
REGULATOR

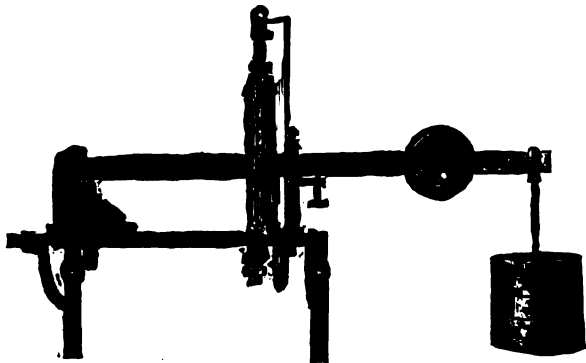
IMPROVED STEAM AND PUMP PRESSURE REGULATORS

Size, in.....	Bronze Body			Iron Body											
	1	1½	1¾	2	2½	3	4	5	6	7	8	10	12	13	
Face to face, in....	4½	4¾	4¾	6¼	8¼	10¼	11¼	12¼	14¼	16¼	18¼	21	24	26¼	
*Diam. flanges, in..	**	**	**	**	7½	8¼	10	11	12½	14	15	17½	20½	23	
Diam. globe, in....	2½	2¾	3	3½	4¼	5¼	6¼	7¼	8¼	10¼	12¼	15	17½	20	
Diam. cover, in....	3½	3¾	3¾	4½	5	6	6¾	7¾	8¾	10¾	12¾	14	16	19	
Center of pipe to bottom, in.....	2½	2¾	2¾	3¼	4¼	4¾	5¼	5¾	6¾	7¾	8¾	10	11¼	13	
Center of pipe to top, in.....	7¾	7¾	7¾	10¼	11¼	12¼	13	13½	14¼	16	19½	21¼	23	25	
Net weight, lbs....	10½	11	12	33	64	105	145	167	247	355	490	750	.....	.....

*All flanges standard for extra heavy pressure. **Screwed.

d'Este Hydraulic Damper Regulator

This regulator is a simple, compact and sensitive mechanism operated by water pressure and will control a damper on a slight variation of boiler pressure. It is designed especially for conditions that require heavy loads. Made in three sizes, 2-, 3-, and 4-in. motors.

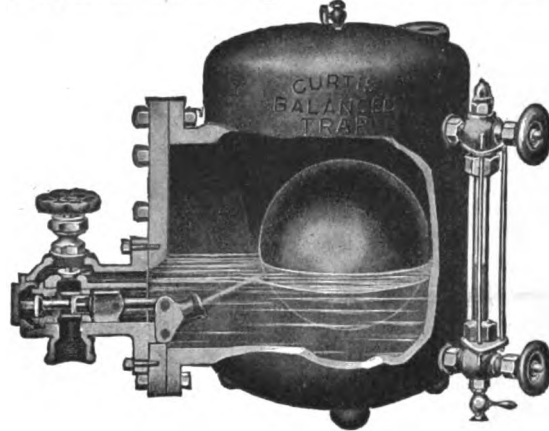


d'ESTE HYDRAULIC DAMPER REGULATOR

Curtis Balanced Steam Trap

For all manufacturers having vacuum pans in use, and for those having a large amount of steam and heavy condensation to contend with, this trap is a valuable aid, working, as it does, without starts or stops which

occasion jarring and straining. It is made of close grained cast iron, and is amply strong to withstand 200 lbs. pressure. It allows for the removal of both valve and float by taking off cover plate at the side. The trap is fitted for a glass water gage that does away with guess work in maintaining a water seal for the float.

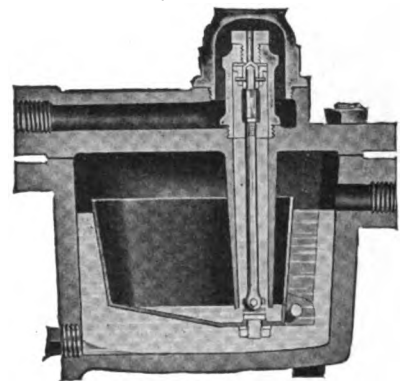


CURTIS BALANCED STEAM TRAP

Trap No.....	000	00	0	1	2	2½	3	4	5	6
Top to bottom, in	11	12	13	14½	15½	17	18	20½	22	22
Front of valve to back of trap, in	13½	16¼	17¼	18½	19¼	20¼	22	23½	28	28½
Diam. trap, in....	8	9½	10¼	11	12	12½	13½	14½	16½	16½
Diam. cover, in....	8½	9	9	12	12	12	13	13	13½	13½
Outlet and inlet, in	½	½	½	¾	1	1¼	1½	2	3	4
Outlet to bottom of trap, in.....	0	1¼	1¼	2	1¼	1¼	2	1¼	3¼	1
Float, in.....	5	6	6	8	8	8	8	8	8	8
Weight, lbs.....	50	75	82	112	145	168	189	230	385	410

d'Este Bucket Trap

This trap is a simple, accessible, positive mechanism for removing condensate from pipe lines. Will operate on pressures from 0 to 250 lbs. Built to give rugged, efficient service.



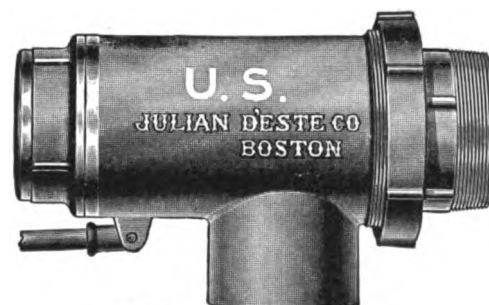
d'ESTE BUCKET TRAP

Sizes are as follows:

No.	Size
No. 1.....	½ in.
No. 2.....	¾ in.
No. 3.....	1 in.
No. 4.....	1¼ in.
No. 5.....	1½ in.
No. 6.....	2 in.

U. S. Ball Cock

Full sized area; valve is balanced; will not hammer even under pulsation of a pump; perfectly noiseless. Renewable seat of bronze metal. Good in any place for high or low pressure. Sizes, ½ to 4 in.



U. S. BALL COCK, 4-INCH

ATLAS VALVE COMPANY

Manufacturers of Pressure and Temperature Regulators

NEWARK, N. J.

Products

VALVES: Reducing, Balanced and Float.

REGULATORS: Damper, Fan Engine, Pressure, Vacuum and Temperature.

PUMP GOVERNORS; SWING JOINT FITTINGS.

Also High Pressure Hydraulic Regulators, Humidity and Stoker Regulators, Thermostats and Hygrostats.



FIG. 104. REDUCING VALVE, ATLAS TYPE "A"

Auxiliary operated type in which main valve is operated by a piston. For continuous or dead end service, steam or air and for any initial pressure up to 300 lbs. Sizes, $\frac{1}{2}$ to 10 in., $\frac{1}{4}$ to 2 in. all-bronze with union ends; 2 $\frac{1}{2}$ to 10 in. cast iron bodies, bronze mounted. Valves above 2 $\frac{1}{2}$ in. with bronze bodies can also be furnished. Cast steel valves with monel metal internal parts furnished for superheated steam.

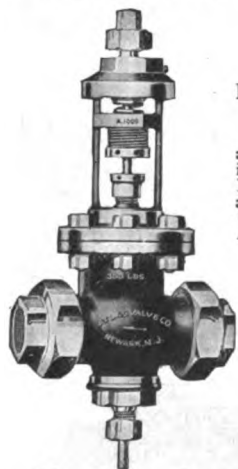


FIG. 202. PUMP GOVERNOR AND FAN ENGINE REGULATOR, ATLAS TYPE "A"

An auxiliary operated governor with a limit screw adjusted to limit speed of pump or engine. For high or low pressure pumping service and fan engine regulation. For working steam pressures from 20 to 300 lbs. and delivery pressures from atmosphere to 10,000 lbs. Sizes, $\frac{1}{2}$ to 10 in., all-bronze 2 $\frac{1}{2}$ to 10 in. with cast iron bodies, bronze mounted.

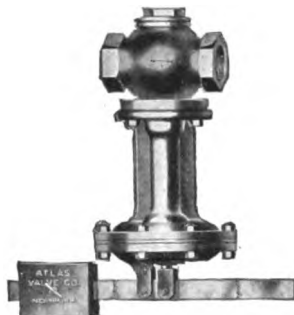


FIG. 304. LEVER OPERATED REDUCING VALVE, ATLAS TYPE "C"

Diaphragm operated, double seated balance valve type. Continuous service where initial pressure does not exceed 125 lbs. Not for dead end or high pressure service. Sizes, $\frac{1}{2}$ to 10 in., cast iron bodies, bronze mounted. Sizes from $\frac{1}{2}$ to 2 in. screwed ends; from 2 $\frac{1}{2}$ to 10 in. flanged ends.

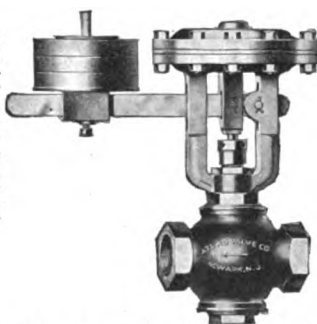


FIG. 210. VACUUM PUMP GOVERNOR, ATLAS TYPE "C"

Diaphragm operated, double seated balanced valve type. For any service where it is necessary to maintain a uniform vacuum. For working steam pressures up to 200 lbs. and any vacuum below atmosphere. Sizes, $\frac{1}{2}$ to 14 in., iron body, bronze mounted. Also furnished all-bronze.



FIG. 604. BALANCED VALVE, ATLAS TYPE "C"

Regularly furnished with double beveled seats. Also furnished with sliding piston seats. Sizes, $\frac{1}{2}$ to 10 in., cast iron bodies, bronze mounted. Also furnished all-bronze.

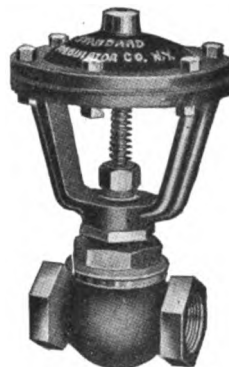


FIG. 14. DIAPHRAGM CONTROL VALVE, VICTOR

Used in connection with Victor temperature regulator and with 3-way cocks or other devices for remote control, using water or air pressure for its operation.

Sizes, $\frac{1}{2}$ to 14 in., globe or angle.

Control valves auxiliary operated for pressures up to 300 lbs. and temperature up to 600° Fahr. also furnished.

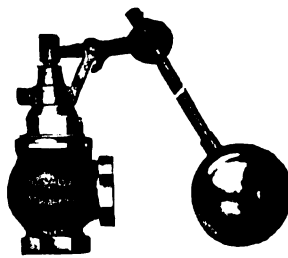


FIG. 214. AUXILIARY OPERATED FLOAT VALVE, ATLAS

Installed on end of line within tank or installed in supply line outside of tank and operated by a float in tank.

Operation is smooth and positive. Will remain drop-tight under severe service.

Sizes, $\frac{1}{2}$ to 8 in., $\frac{1}{4}$ to 2 in. all-bronze; 2 $\frac{1}{2}$ to 8 in. iron body, bronze mounted, globe or angle, screwed or flanged.

All-bronze from 2 $\frac{1}{2}$ to 8 in., also furnished.

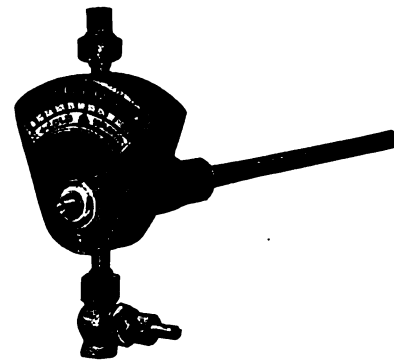


FIG. 12. TEMPERATURE REGULATOR, VICTOR

For regulating temperature of hot water heaters, brine coils, vats, cookers, dry rooms, etc. Operates with water or air pressure.

All-metal construction. Operates diaphragm control valves from $\frac{1}{2}$ to 14 in. with 1° variation in temperature. Adjusted to operate at any temperature up to 400° Fahr.



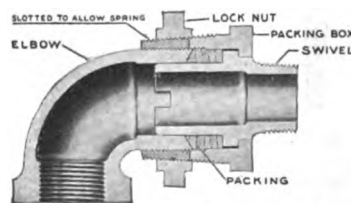
FIG. 503. DAMPER REGULATOR, VICTOR

Made in 3 sizes. Low pressure size for low pressure heating boilers; can be adjusted to operate from atmosphere to 25 lbs. pressure, motor cylinder being 2-in. diameter by 6-in. stroke.

Medium pressure size is of heavier construction and for heating or power boilers; can be adjusted to operate from 5 to 100 lbs. pressure, motor cylinder being 2-in. diameter by 10-in. stroke.

Extra high pressure size is of extra heavy construction and for largest power boilers; can be adjusted to operate from 5 to 250 lbs. pressure. Equipped with compensating attachment which holds damper in balanced position and fully opens or closes damper only on extreme pressure variations. Motor cylinder is 2 $\frac{1}{2}$ -in. diameter by 10-in. stroke.

Regulators with larger cylinder and longer strokes also furnished.



Sectional View of Swing Joint Elbow

FIG. 403. SWING JOINT FITTINGS, ATLAS

For steam, water, air or gas up to 200 lbs. working pressure. These fittings make swivel connections that are free to turn any part of a circle and remain perfectly tight. Sizes from $\frac{1}{2}$ to 6 in. Elbows or tees of all-bronze or with cast iron elbows or tees and bronze swivels.



Swing Joint Elbow



Swing Joint Tee

G. M. DAVIS REGULATOR CO.

Manufacturers of Valve Specialties

418 Milwaukee Avenue
CHICAGO, ILL.

BRANCHES

NEW YORK

BOSTON

PHILADELPHIA

PITTSBURGH

BALTIMORE

SAN FRANCISCO

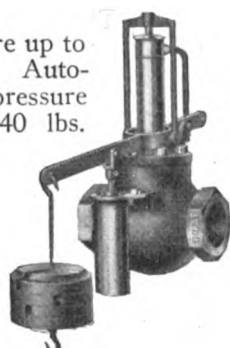
Products

An extensive line of Valve Specialties, including PRESSURE REGULATORS and VALVES; STEAM TRAPS; and BALANCED, FLOAT, EXHAUST RELIEF, STOP and CHECK, and SPECIAL VALVES.

Also manufacturers of Water Control, Combination Back Pressure and Relief, Non-return and Altitude Valves, Damper and Flow Regulators, Pump Governors, and many other specialties.

Pressure Regulator

Piston type. For initial pressure up to 250 lbs.—steam, air, oil or water. Automatically reduces from any initial pressure to any delivery pressure under 40 lbs. Valves for air and water and those for greater delivery pressures than 40 lbs. constructed especially for the service. Sizes $\frac{1}{2}$ to 14 in.



PRESSURE REGULATOR



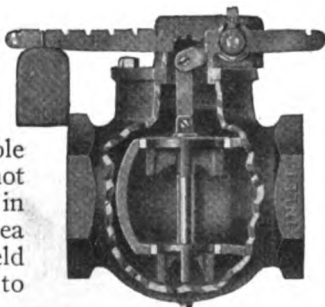
LOW PRESSURE
REGULATOR

Low Pressure Regulator

P. & W. diaphragm type, designed for reduced pressure of 5 lbs. or less. Having rubber diaphragm of large area it is very sensitive and is used largely on vacuum and low pressure heating systems. Sizes $\frac{1}{2}$ to 20 in.

Back Pressure Valve

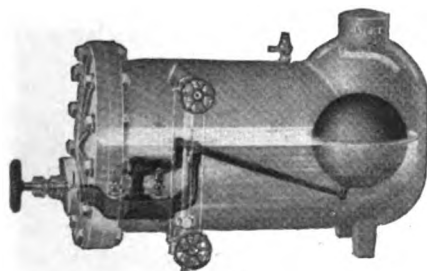
For maintaining any desired back pressure in an exhaust steam line. Double piston type valve. Will not stick or bind; noiseless in operation. Full pipe area through seats and may be held open permanently. Sizes 2 to 30 in.



BACK PRESSURE VALVE

Steam Trap

Discharges continuously under any pressure from 0 to 250 lbs. Double cone shaped balanced valves. Valves and seats of Tobin bronze and are renewable.

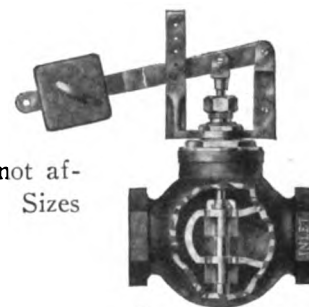


STEAM TRAP

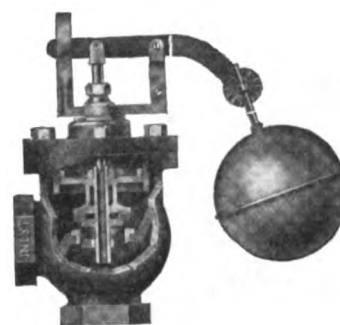
Water sealed to prevent steam leakage.

Balanced Valve

For working pressures up to 200 lbs. Can be used with steam, air, gas, water or other fluids. Adapted to purposes requiring a valve not affected by internal pressure. Sizes $\frac{1}{2}$ to 14 in.



BALANCED VALVE



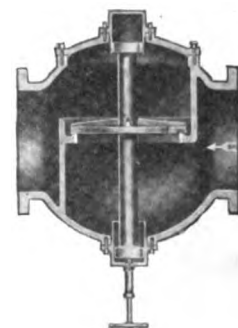
FLOAT VALVE

Float Valve

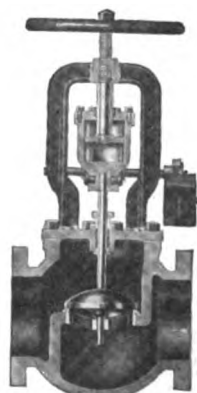
Automatically maintains constant level in tank. Renewable seat and disc; will not stick; no leather cup packing; closes tight without leakage. Sizes $\frac{1}{2}$ to 14 in.

Exhaust Relief Valve

For use with engine or turbine running both condensing and non-condensing. Holds tight under vacuum; may be set to maintain a back pressure. Horizontal or vertical types. Sizes 6 to 48 in.



HORIZONTAL EXHAUST
RELIEF VALVE



STOP AND CHECK
VALVE

Stop and Check Valve

Prevents reverse flow of steam. Will not stick on account of scale formation or uneven expansion of parts. For any pressure up to 350 lbs. and any temperature up to 800° F. Sizes 2 to 12 in.

Special Valves

This company has facilities for making special valves for any service. The big 72-page catalogue describes the complete line of standard valve specialties.

JENKINS MACHINE COMPANY

Manufacturers of Engine Stops

SHEBOYGAN, WIS.

Product

FRICTIONLESS AUTOMATIC ENGINE STOPS.

Purpose of the Falls Automatic Engine Stop

Falls engine stops provide a reliable protection for engine room equipment against engine runaways, flywheel explosions, main belt or rope drive failure, cylinder head blowouts. Not only will the Falls engine stop automatically shut off the steam should the flywheel overspeed, but furthermore, by means of stop stations located in the engine room or at various points in the plant, the engine can be instantly shut down from any electrical stop station by simply breaking a glass panel or by a sharp pull from any of the mechanical stop stations.

Salient Features of Falls Engine Stops

The Falls automatic engine stop will positively shut off the steam at the first indication of dangerous speed, and as it is *frictionless and packingless*, it is absolutely reliable.

It is operated by gravity, actuated directly and instantaneously, and is 20% greater in area than the steam line for which it is designed. Direct tripping device on engine shaft provides the simplest and surest method of indicating overspeed.

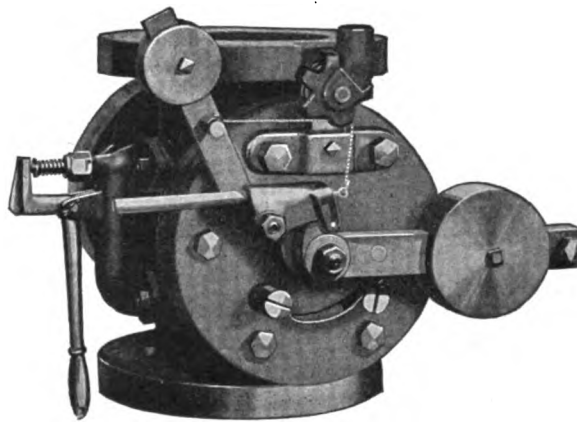
The Falls engine stop is to the engine what the safety valve is to the boiler. Casualty company statistics show that there are approximately 33% more flywheel explosions than boiler explosions and that the former are 50% more costly. There are many instances on record where loss of life, property, profits and business caused by flywheel explosions could have been prevented by the installation of Falls engine stops. The cost of this device is infinitesimal as compared to the property it protects.

The Falls engine stop protects property by enabling any one to instantly shut down the engine from any part of the plant. It saves money by preventing losses such as fires, burned belts, broken machinery, maimed employees, racing engines and *flywheel explosions*. Its effectiveness in these respects has been repeatedly proved in service for a number of years.

The maintenance factor is eliminated almost entirely for there is nothing that can gum, stick or jam during long periods of idleness. It is a complete and independent unit in itself and in no way relies (for its operation) upon any function of the machinery that it protects.

Easily and quickly installed, thus no interruption to plant operation.

All equipment guaranteed against defective material and workmanship for a period of one year.



FALLS MECHANICAL ENGINE STOP

Field of Application and Types of Control

Falls automatic engine stops can be fitted to any type and size of steam engine and in either vertical or horizontal steam lines.

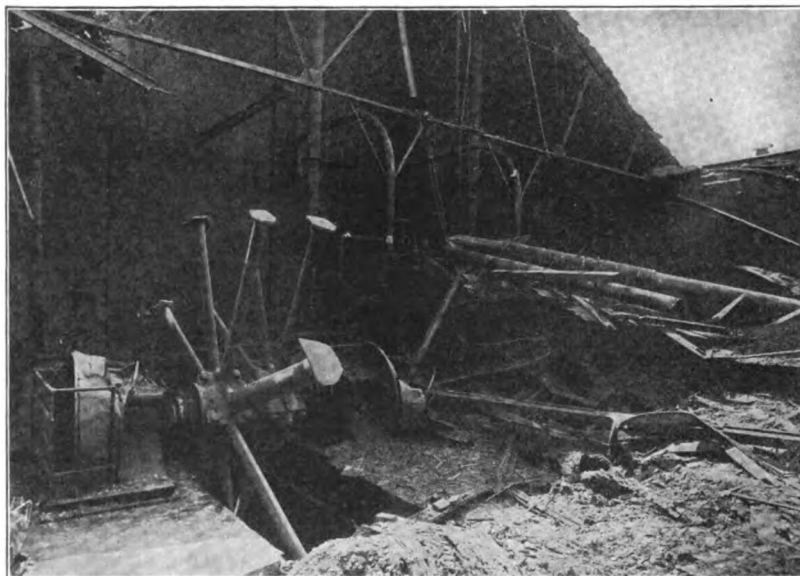
Three distinct types of engine stop control are offered: *Mechanical* by means of braided wire cable; *electrical closed circuit*; or *electrical open circuit* (on high voltage, alternate current or direct current, or battery sets)—in accordance with local conditions.

Any number of stopping stations may be installed, located as desired throughout the plant.

Indorsement and Use

Falls engine stops are indorsed by all the large casualty companies, state industrial commissions, factory inspection departments, and other safety bureaus.

They are used by the United States government and the world's largest industrial plants.



FLYWHEEL EXPLOSIONS LIKE THIS ARE IMPOSSIBLE IF PLANT IS EQUIPPED WITH FALLS AUTOMATIC ENGINE STOPS

Illustration shows wreckage caused by the bursting of two 20-ft. flywheels, killing the engineer and injuring five others. The loss was estimated at \$160,000.00

KITTS MANUFACTURING CO.

ESTABLISHED 1887

Steam Specialties

1921 West Seneca Street

OSWEGO, N. Y.

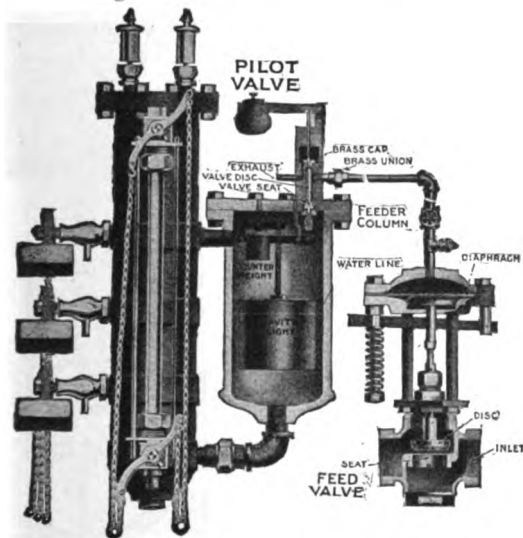
Products

SAFETY FEED WATER REGULATORS; T. C. STEAM TRAPS; REDUCING VALVES; FAN ENGINE REGULATORS; EXCESS PUMP GOVERNORS; SINGLE BOILER FEEDER and WATER SUPPLY GOVERNORS.

Also manufacturers of Hydraulic Damper Regulator, Vacuum Pressure Reducing Valves, Vacuum Pump Governors, Vacuum Traps, Bucket Steam Traps, Safety Water Columns, Pump Pressure Regulators, Altitude Governors, Low Pressure Boiler Feeders, Air Regulators.

Kitts Safety Feed Water Regulator

An economical safety device which maintains a constant water level in boilers and effects big savings in coal bills. Simple, durable and absolutely reliable. It insures the greatest possible efficiency, furnishes dry steam to engines and pumps and prevents strain on boilers due to unnatural expansion and contraction because it maintains a constant water level. Furnished with or without the high and low alarm water column.



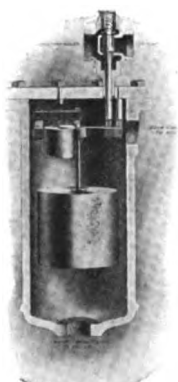
KITTS SAFETY FEED WATER REGULATOR

Single Boiler Feeder and Water Supply Governor

No. 1—Used to perfectly control boiler feed pump and water line in a single boiler installation. Valve closes as water rises. The valve and all wearing parts are of bronze or brass, the casting and cover of cast iron.

No. 2—A yoke valve which opens as water rises. Used on tank and pump installations of return systems, such as schoolhouse or hospital work.

No. 3—A yoke valve which closes as water rises. Used on any water supply system, especially where make-up water is required on a heating system.

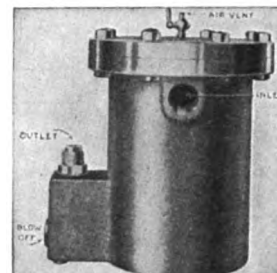


NO. 1 BOILER FEEDER AND WATER SUPPLY GOVERNOR

New Parker Steam Trap

Free trial for 30 days.

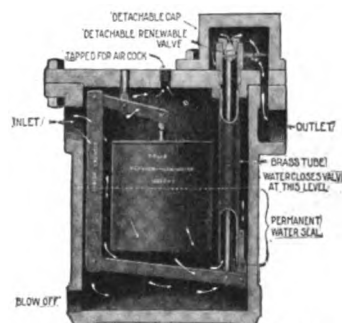
In several years tests, takes care of more condensation than most of the traps on the market. Positively water sealed at all times. Valves and seats easily replaced. Patented by the man who has built "Kitts" goods for over 30 years.



PARKER STEAM TRAP

Kitts Twentieth Century Steam Trap

A powerful trap that operates without a float. It saves all the steam. Seats and disks easily renewable. The trap is water sealed at all times and can not blow steam.



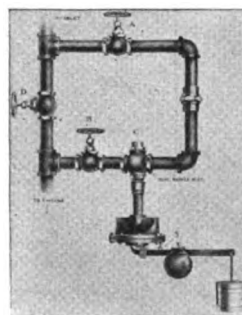
TWENTIETH CENTURY STEAM TRAP

Kitts Steam Pressure Regulating Valves

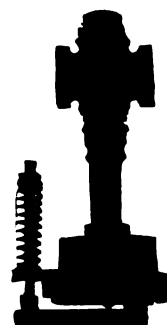
Adapted for every purpose. In extensive use in some of the largest steam heating plants in the United States.

Kitts Fan Engine Regulator

Automatically controls the engine used for forced or induced draft, also automatic stoker systems. Built on steel points and very sensitive in operation. For pressures above 125 lbs., a phosphor bronze reinforcement is furnished in addition to the rubber diaphragm.



FAN ENGINE REGULATOR



SPRING TYPE REDUCING VALVE



EXCESS PUMP GOVERNOR

Kitts Excess Pump Governor

It makes a feed pump deliver a steady, sure supply of feed water, under automatic control, regardless of the variation in steam pressure at the throttle. There is no other pump governor with such a perfect control.

LOCKE REGULATOR CO.

Manufacturers of Steam Appliances

SALEM, MASS.

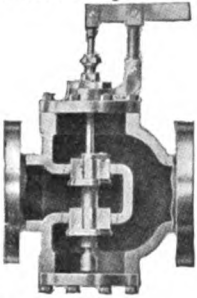
PITTSBURGH OFFICE, Jos. Cawley, Mgr., Ferguson Building
NEW YORK OFFICE, 50 Church Street

SAF. FRANCISCO OFFICE, Wm. Ernst, Mgr., 154 First Street

Products

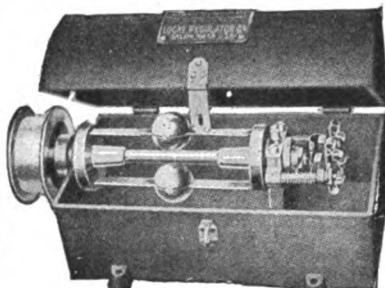
REGULATORS; VALVES; AUTOMATIC ENGINE STOPS of various types; SPEED LIMITS; FIRE PUMP GOVERNORS.

Also manufacturers of "Locke" Steam Pressure and Boiler Feed Pump Regulators; "Beats All" Hydraulic Pump Governors; Valves: Auxiliary Electric, By-pass Water Relief, Vacuum Breaker, Differential, Exhaust Relief, Atmospheric Relief, Automatic Safety Shut-off, Renewable Disc Globe, Check, Closed Circuit, etc.; Steam Separators; Test and Charging Boards, etc.



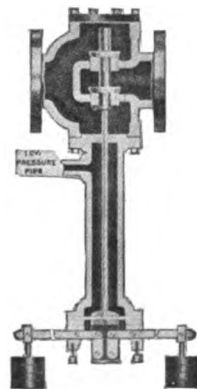
"LOCKE" BALANCE VALVE

Sizes: 1, 1½, 1¾, 2, 2½, 3, 3½, 4, 5, 6, 7, 8, 10 and 12 in.
Prices range from \$9.00 to \$329.00



"LOCKE" SPEED LIMIT

Driven from main shaft; follows every revolution of engine; if speed be above normal it makes electric contact, shutting off steam from engine



"LOCKE" DOUBLE LEVER REDUCING VALVE

Constructed to operate levers and weights for high reduced pressures, or with a single lever for light reduced pressures; inverted diaphragm eliminates stuffing box around valve rod.

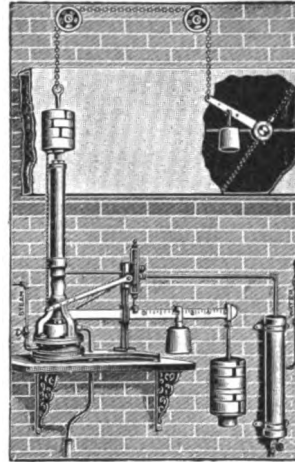
State, in ordering, use of valve, initial and reduced pressures



"LOCKE" "BEATS ALL" REDUCING VALVE

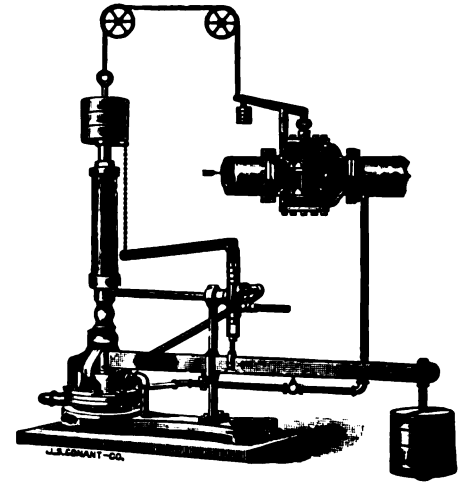
SIZES AND PRICES "LOCKE" "BEATS ALL" REDUCING VALVE

Size, in.	½	¾	1	1½	2	2½	3	4
Length of valve, in.	3	3	3½	4½	5	5½	6½	7½
Price	\$17.00	\$21.00	\$26.00	\$32.00	\$40.00	\$51.00	\$66.00	\$83.00



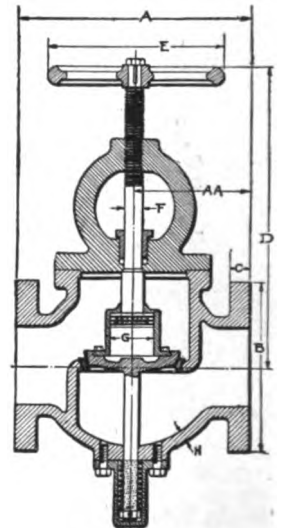
IMPROVED "LOCKE" HYDRAULIC DAMPER REGULATOR

Hydraulic regulator actuated by water pressure, admitted through valve to damper operating motor; valve is made to open and close by fluctuation of boiler pressure as it acts under diaphragm, moving weighted lever to which spindle to valve is attached. Cut-off attachment prevents full stroke of damper



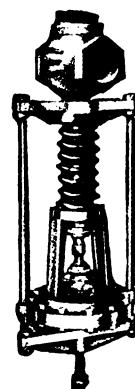
"LOCKE" COMBINATION PRESSURE REGULATOR

Indispensable for controlling large valves at slightest variation of pressure. Especially adapted for: regulating steam to digestors, controlling blower engines for forced draft, sugar refineries, etc. No amount of resistance caused by dirt or friction will interfere with its close regulation. Guaranteed to operate within ½-lb. variation



IMPROVED "LOCKE" NON-RETURN STOP AND CHECK VALVE FOR HORIZONTAL OR VERTICAL PIPING

Designed to prevent back flow from main steam pipe in case of accident to boiler, such as blowing out of tube. Noiseless. Dashpot prevents chattering



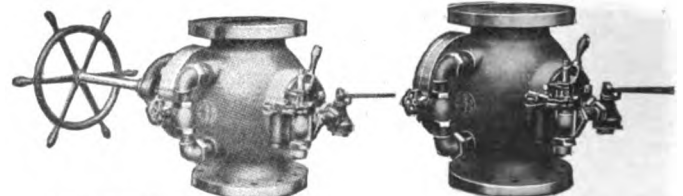
"BOARDMAN" FIRE PUMP GOVERNOR

Listed by Underwriters' Laboratories, Inc., among improved devices

DIMENSIONS OF "LOCKE" GLOBE AND ANGLE VALVES IN INCHES

	4	4½	5	6
A	14	15	15½	17½
AA	7	7½	7½	8½
B	10	10½	11	12½
C	1½	1½	1½	1½
D	14	15	17	19
E	13	13	13	16
F	1½	1½	1½	1½
G	3½	3½	3½	3½
H	1½	1½	1½	1½

	7	8	9	10
A	19½	21	23	25
AA	10½	10½	11½	12½
B	14	15	16½	17½
C	1½	1½	1½	1½
D	21	23	24	26
E	16	16	20	20
F	1½	1½	1½	1½
G	3½	3½	4½	4½
H	1½	1½	1½	1



Large Combined Throttle Type
Opened or closed at will, shutting down engine when speed increases above normal

Independent Type
Installed in supply pipe between throttle valve and main steam header

"LOCKE" AUTOMATIC ENGINE STOP VALVES

MASON REGULATOR CO.

Pressure Regulating Appliances
BOSTON, MASS.

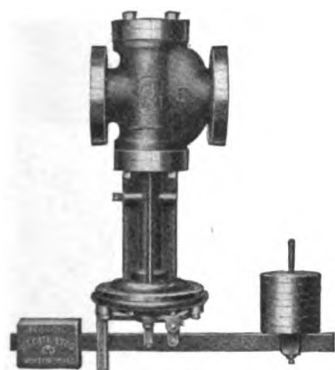
Products

REDUCING VALVES and PRESSURE REGULATORS for Steam, Water and Air; STEAM PUMP PRESSURE REGULATORS; BALANCED and FLOAT VALVES; HYDRAULIC DAMPER REGULATORS; STRAINERS.

Also manufacturers of Steam Pump Speed Governors and Horizontal Pressure Controlling Devices.

Reducing Valves

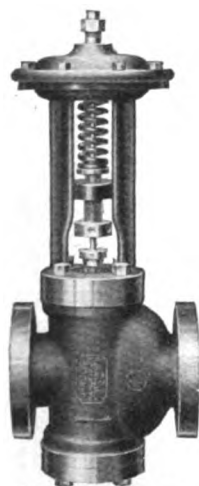
Reduce and maintain an even pressure of steam or air regardless of the variation of the initial pressure or of the volume of steam or air required. Automatically reduce boiler pressure for steam heating systems of all types (vacuum systems included), central heating plants, engines, paper machines, slashers, dye kettles and all situations where it is desirable to use a lower pressure than that on the boiler. Furnished in the auxiliary operated, lever and weight, and other types. All-bronze for initial pressures of 300 lbs., and iron body for pressures up to 180 lbs.



REDUCING VALVE,
LEVER STYLE



STANDARD REDUCING
VALVE



NO. 55. STEAM
PUMP PRESSURE
REGULATOR

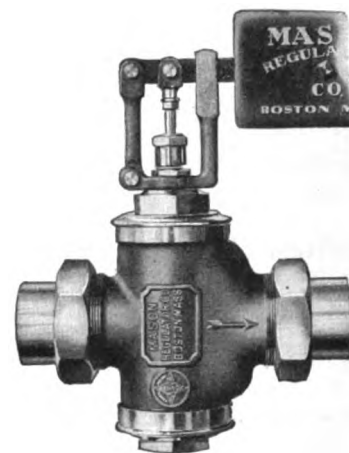
Steam Pump Pressure Regulators

Designed for fire, boiler feed, air and water works pumps, or any class of pumping machinery where it is necessary to maintain constant pressure. They are placed in the steam supply pipe to the pump, and connected by a 1/4-in. pipe to the discharge system, thereby exactly regulating the amount of steam to the requirements of the pump, and automatically maintaining a uniform discharge pressure regardless of any variation of steam pressure or demand on the pump.

Balanced and Float Valves

Used to control pumps, engines and the like, by means of tank floats or cords to distant points, and also in connection with various devices for the control of water to receivers, open heaters and other similar devices. They are made in both the double seated or disk and piston type, with weight and lever or float attachment.

Regularly furnished extra heavy, suitable for pressures up to 200 lbs.

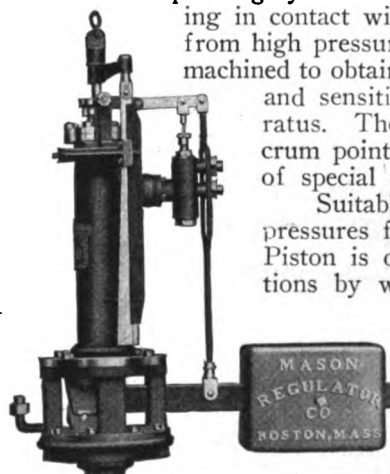


BALANCED VALVE YOKE
AND LEVER TYPE

Hydraulic Damper Regulator

The design of the compensating device, which is positive in its action, insures the closest possible regulation. The operating cylinder as well as all parts coming in contact with the water are made from high pressure bronze and carefully machined to obtain the greatest durability and sensitive action of the apparatus. The knife edges and fulcrum points of the lever are also of special construction.

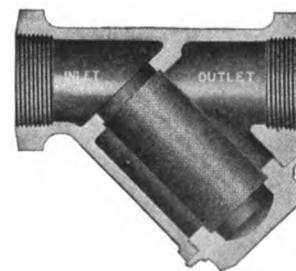
Suitable for controlling boiler pressures from 1 or 2 to 200 lbs. Piston is operated in both directions by water pressure, permitting use of rod connections to overhead shafting, which is desirable in the larger installations where a number of flue dampers are to be operated in unison.



HYDRAULIC DAMPER REGULATOR

Strainers

For use on steam or air lines to prevent sediment, scale, bits of packing or other foreign material passing into the reducing valve or other pressure regulator installed on the line, assuring the user of continuous service. Constructed not to reduce the volume of steam or air passing through them, yet are compact and self-cleaning without removing them from the line.



STRAINER
Sizes, 1/2 in. to 6 in.

McDONOUGH COAL SAVING CORPORATION

Manufacturers of Coal Saving Specialties

3952 Grand River Avenue

DETROIT, MICH.

REPRESENTATIVES IN ALL PRINCIPAL CITIES IN UNITED STATES AND FOREIGN COUNTRIES

Products

McDONOUGH SYSTEM of CONTROLLING COAL, AIR and WATER, which includes Draft Regulators, Stoker Regulators, Steam Pressure Recording Gauges, Boiler Feed Regulators, Pump Governors and Strainers.

McDonough System

The McDonough System is a complete, automatic system, for the control in a boiler plant of the three elements—coal, air and water—used in the generation of steam.

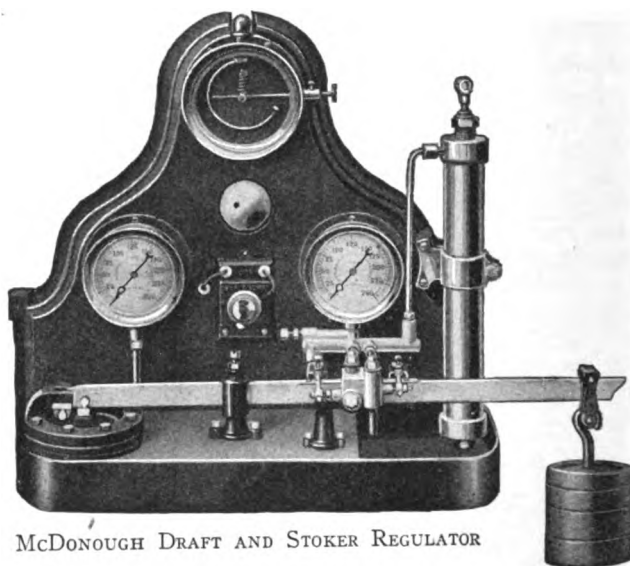
The system regulates the speed of the stokers, dampers, forced or induced draft engines and the speed of the boiler feed pumps.

The system includes a steam gauge showing the boiler pressure; a water gauge showing the operating water pressure; a recording gauge recording boiler pressure; a colored signal lamp which shows the position of the dampers; an alarm bell which rings when the steam becomes low; also a boiler feed regulator and a pump governor.

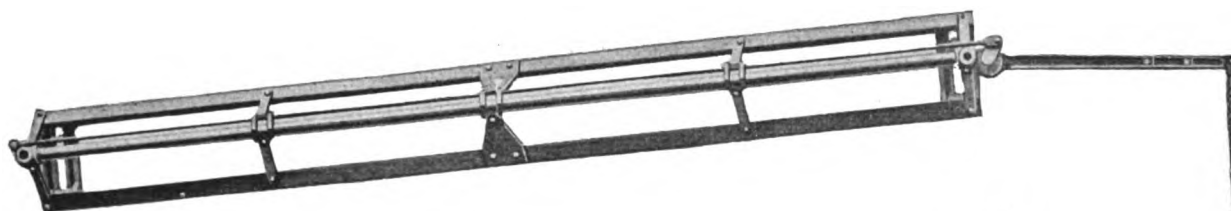
Advantages—The advantages gained through the use of the McDonough System are primarily a saving of coal, 10% as a minimum.

Boiler Feed Regulators

This regulator controls automatically the supply of water fed to the boilers. The expansion tube is placed



McDONOUGH DRAFT AND STOKER REGULATOR

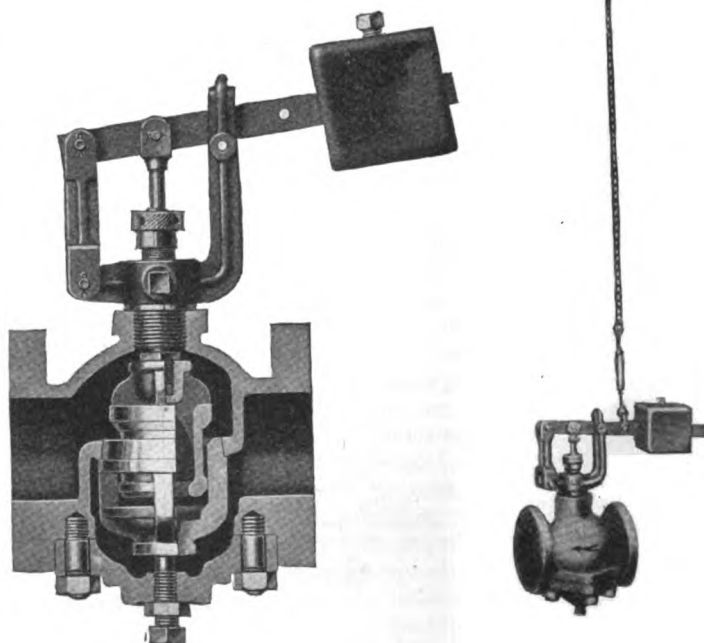


A secondary advantage is the more even maintenance of steam pressure: drier steam, less expansion and contraction of the boilers, furnaces, arches, linings, grates and tubes. There is an elimination of many boiler plant troubles and a minimum attention required on the part of the boiler room attendants.

Incredible amounts in reduced operating costs in coal saving through the McDonough System are being produced in hundreds of steam plants in every line of industry where steam is generated.

In one plant of a prominent steel firm a weekly saving of 10 carloads of coal is effected. In another plant 100 to 110 tons of coal daily; and proportionate amounts in smaller plants.

Operation—When the load on the boilers varies, the draft is increased or decreased, a greater or lesser quantity of coal and water is supplied to the furnaces and boilers, proportionate to the demand on the boilers for steam and all in proper relation to each other.



McDONOUGH BOILER FEED REGULATOR AND FEED VALVE

in an inclined position, the upper end of the expansion tube being filled with steam while the lower end is filled with water.

As the water rises or falls in the boiler, it correspondingly rises and falls in the regulator tube, causing it to contract or expand, and this motion is directly transmitted to the valve, regulating the opening of the valve to admit the proper quantity of water to the boiler.

Points of Superiority—Valve and cage, easily accessible—easily removable through opening at bottom of valve. Valve seats being beveled, prevent leakage—hold tight on banked fires—100% efficient in regulation.

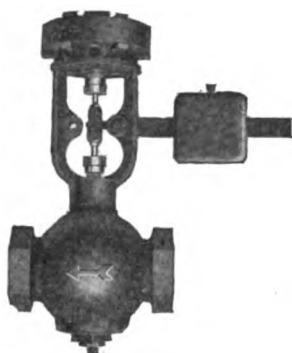
Note liberal amount of metal for regrinding—the valve will give excellent service and outlast life of boiler; replace parts are unnecessary.

Expansion Tube Structure—Tube structure prevents vertical or sidewise buckling. Lever operates valve from either steam or water end of tube. Radial slots at either end of the tube permit incline of regulator after installation.

Advantages—Through the operation of McDonough regulator, pressure variation at heavy loads is less, quality of steam is drier, degree of superheat more uniform and greatly increased economy and efficiency is obtained in a boiler plant.

Pump Governors

The McDonough governor (differential type) is particularly designed for automatic regulation of recip-



McDONOUGH PUMP GOVERNOR (DIFFERENTIAL TYPE)

rocating or turbine driven feed water pumps. It maintains any differential pressure desired in the pump discharge pipe over the boiler pressure.

Cap opening in the bottom of governor body for quick and easy removal of valve parts.

Valve and cage of same construction as shown in valve of McDonough boiler feed water regulator.

One adjustment only—by moving weight on lever arm. Built in every size required.

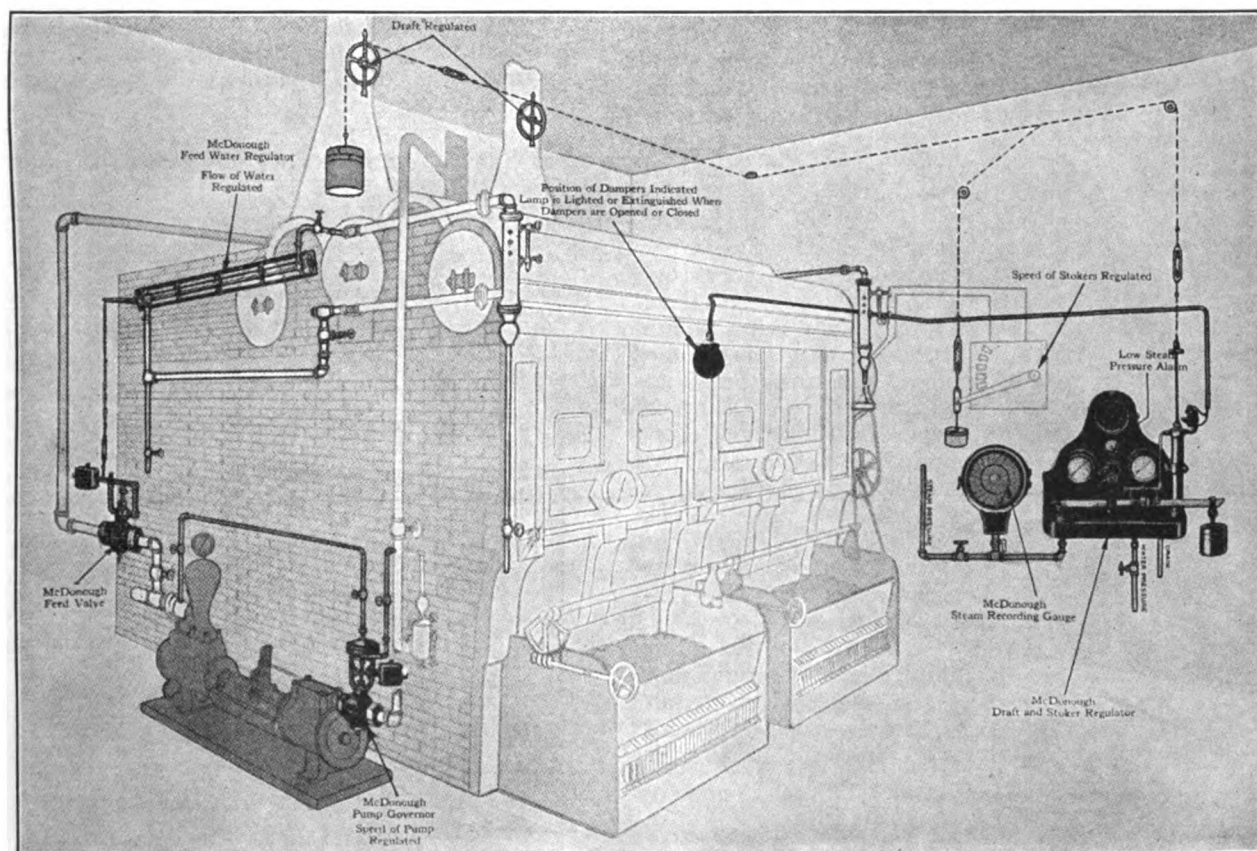
Catalogue

Send for catalogue.

Purchasers

The variety of industries using the McDonough Coal Saving System is partly indicated by the following list of purchasers:

Carnegie Steel Co., Pittsburgh, Pa. (32 Systems)
 Logan County Light, Heat & Power Co., Logan, W. Va.
 American Sheet & Tin Plate Co., Pittsburgh, Pa. (22 Systems)
 University of Michigan, Ann Arbor, Mich.
 Middletown Gas & Electric Co., Middletown, Ohio
 Columbia Sugar Co., Bay City, Mich.
 Blish Milling Co., Seymour, Ind.
 Globe Soap Co., Cincinnati, Ohio
 Cooper-Carlton Hotel, Chicago, Ill.
 National Stove Co., Lorain, Ohio
 Ohio Valley Refining Co., St. Marys, W. Va.
 Colonial Ice Co., Pittsburgh, Pa.
 Indianapolis Abattoir Co., Indianapolis, Ind.
 Lincoln Cotton Mill Co., Evansville, Ind.
 U. S. Aluminum Co., New Kensington, Pa.
 Suburban Water Co., Verona, Pa.
 Sloane & Moller, Inc., New York, N. Y.
 American Laundry Co., La Porte, Ind.
 Jas. H. Matthews & Co., Pittsburgh, Pa.
 Best Foundry Co., Bedford, Ohio
 Mennel Milling Co., Fostoria, Ohio
 Calumet Steel Co., Chicago Heights, Ill.
 Indiana & Michigan Electric Co., South Bend, Ind.



McDONOUGH SYSTEM FOR THE AUTOMATIC REGULATION OF COAL, AIR AND WATER

THE POWERS REGULATOR CO.

Manufacturers of Automatic Temperature Controlling Apparatus

GENERAL OFFICES AND FACTORY
2783 Greenview Avenue
CHICAGO, ILL.

GENERAL EASTERN OFFICES
902 Architects Building
NEW YORK, N. Y.

BRANCHES

BOSTON, MASS., 263 Summer Street
CINCINNATI, OHIO, Gerke Building
DETROIT, MICH., 919 Ellery Avenue
CLEVELAND, OHIO, 1660 East 75th Street
BUFFALO, N. Y., 852 Ellicott Square

SAN FRANCISCO, CAL., Hobart Building
SEATTLE, WASH., Alaska Building
KANSAS CITY, MO., 400 Chambers Building
SALT LAKE CITY, UTAH, Walker Bank Building
LOS ANGELES, CAL., 629 South Grand Avenue

BUTTE, MONT., 207 Daly Bank Building

THE CANADIAN POWERS REGULATOR CO., LTD., TORONTO, CAN., WITH BRANCHES AT MONTREAL, WINNIPEG, CALGARY, VANCOUVER

Products

APPLIANCES for the AUTOMATIC REGULATION of HEATING and COOLING MEDIUMS and similar general purposes, all the result of years of research and experience in this one line of temperature control, and covered by the Powers guaranty of perfect workmanship and efficiency.

Variety and Adaptability

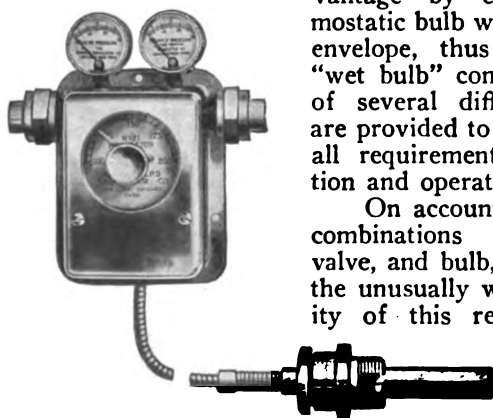
The specialties here shown are quite flexible in their adaptation to different temperature controlling requirements and offer a variety designed to cover the field. New problems, however, are welcomed, and correspondence invited.

Liquid Air or Gas Temperature Control

No. 21 Regulator—A compressed-air operated regulator with flexible extension bulb, for use with diaphragm valves and motors, in the automatic control of heating and cooling mediums, especially where the adjusting mechanism must be located at considerable distance from point where temperature is to be controlled. The instrument has an adjustment range of 100°, and can be furnished for processes involving temperatures anywhere between 0° and 1000° Fahr. Regulator and valve bear the same relation to each other and are connected as in the illustration of the No. 14B Regulator on the following page. Valves of the rubber diaphragm or all metal type may be used.

This regulator can be furnished either direct acting or reversed, and the valves with which it is used have a similar flexibility so that combinations given absolute certainty in the control of either heating or cooling mediums may be readily secured. In many humidity controlling operations this regulator can be used to advantage by covering thermostatic bulb with a saturated envelope, thus producing a "wet bulb" condition. Bulbs of several different designs are provided to properly meet all requirements of installation and operation.

On account of the many combinations of regulator, valve, and bulb, which permit the unusually wide adaptability of this regulator, it is



No. 21 REGULATOR

impracticable to quote prices here. Ask for Bulletin 147 for complete detailed information, price lists, etc.

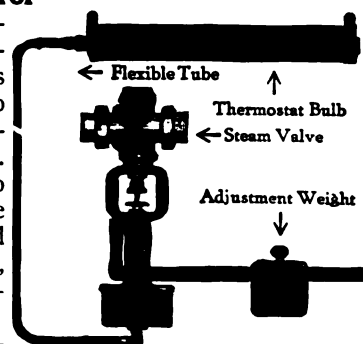
Air Temperature Control

No. 15 Regulator—

For control of atmospheric temperatures where thermostatic bulb must be located some distance from steam valve. Particularly adapted to lumber kilns, smoke houses, textile and leather drying processes, grain and vegetable dryers, etc.

Entirely self-contained, of rugged construction, built for hard wear and long life; no perishable rubber diaphragms; exceedingly sensitive; control within 1° or 2° may be expected.

Adjustment for different temperatures is accomplished by changing the position of the lever weight which can be locked when proper location is determined. Bulletin 138.



No. 15 REGULATOR

PRICE LIST AND SHIPPING WEIGHTS NO. 15 REGULATOR

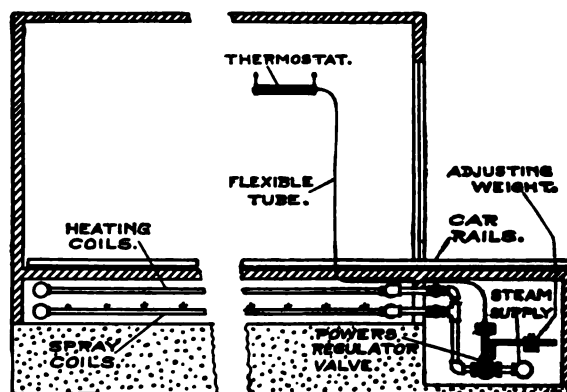
Valve size, in.	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4
Weight, lbs.	50	50	55	60	65	70	90	100	140
Price	\$70	75	80	85	90	100	110	125	150

Always specify desired operating temperature, steam pipe size, steam pressure, and state fully the purpose for which regulator is to be used, with range of adjustment.

Valves to 1 1/4 in. inclusive have bronze bodies, with unions. The 2 to 3 in. inclusive have iron bodies screwed; larger than 3 in., iron bodies flanged, with standard drilling. Companion flanges and bolts furnished extra when desired.

Standard flexible tube length, 8 ft.; additional length, \$1.00 per ft., net.

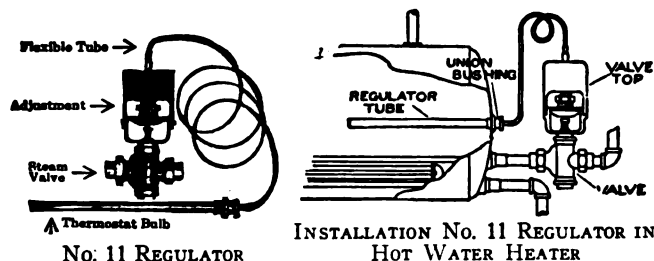
Reversed valves for control of cooling mediums will be furnished at a slight extra charge.



TYPICAL INSTALLATION NO. 15 REGULATOR IN A LUMBER KILN

Liquid Temperature Control

No. 11 Regulator—Controls the temperature of liquids of all kinds under all conditions. Self-contained, requiring no water or other auxiliary operating power. All-metal. Of great durability, guaranteed accurate and positive in action. Very easily installed. Largely used on hot water tanks and heaters, glue heaters, paraffin and grease tanks, etc. Bulletin 129.



PRICE LIST NO. 11 REGULATOR COMPLETE WITH VALVE

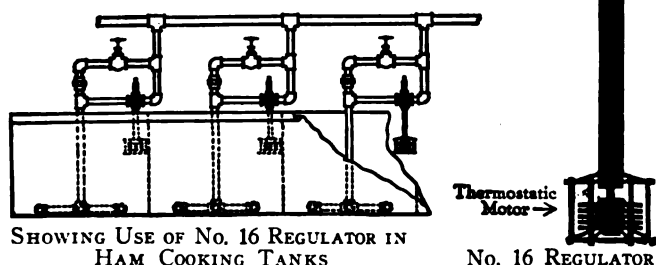
Valve size, in.	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8
Price.....	\$60	65	70	75	80	90	95	100	110	120	175	200	250

Screwed union valves up to 1 1/2 in. inclusive. 2 in., 2 1/2 in. and 3 in., screwed iron body; larger sizes iron body flanged. Standard flexible tube length, on 1 1/2 in. and smaller, 6 ft.; 2 to 4 in., 8 ft.; 6 in. and larger, 10 ft.; additional length, \$1.00 per ft., net. Bulb lengths, 20 to 24 in., requiring 1-in. and 1 1/4-in. tapping.

Always specify desired operating temperature, steam pipe size, steam pressure, and state fully the purpose for which regulator is to be used, with range of adjustment required.

No. 16 Regulator—For the control of liquid temperatures in open vats, for various processes, where it accomplishes wonderful results. Self-contained, requires no air or water pressure for operation. Thermostatic element consists of a pile of thermo-sensitive discs arranged in an open cage, so that a great amount of sensitive surface is exposed to the liquid to be controlled. Standard length from center of valve to bottom of thermostat cage, 19 in., which may be varied on specification.

Bulletin 146 treats particularly of this regulator as applied to the meat packing industry and other applications.



PRICE LIST AND SHIPPING WEIGHTS NO. 16 REGULATOR

Valve size, in.	1/2	3/4	1	1 1/4	1 1/2	2
Low pressure single seat valve.	\$50	55	60	65	70	80
High pressure double seat valve.	\$65	70	75	80	90	100
Weight, lbs.	30	30	30	35	35	45

Add for lever weight adjustment, any size, \$3.00 net.
Small additional charge for "reverse operating" valves.

High Pressure Steam Trap—A small and extremely efficient trap for apparatus using high pressure steam for sterilizers, vulcanizers, dryers, enameling ovens, steam kettles, steam tables, etc. Absolutely positive in operation, discharging freely an exceptionally large volume of water.



HIGH PRESSURE
STEAM TRAP

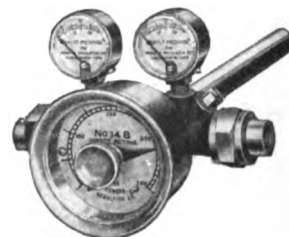
No. 14B Regulator—Exceedingly accurate and reliable. Sensitive to a fraction of a degree. Uses compressed air as motive power.

Used in air conditioning and for cold storage rooms, dry kilns, japanning ovens, varnish rooms, pasteurizers, leather dryers, steam cookers, etc.

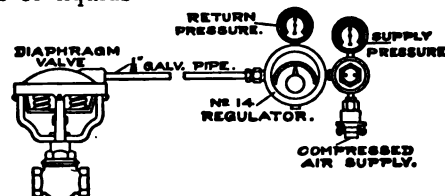
All brass construction; polished nickel finish. Dials glass covered.

With this regulator may be used either rubber or all-metal diaphragm mounted valves of direct or reversed type and adapted to the control of steam, gas or liquids under any pressure; also diaphragm motors for the operation of dampers where heated air or gases are to be controlled.

Bulletin 132



No. 14B REGULATOR



SHOWING METHOD OF INSTALLING
No. 14B REGULATOR

PRICE LIST NO. 14B REGULATOR WITH RUBBER DIAPHRAGM VALVE

Size, in.	1	1 1/4	2	2 1/2	3	4	5	6
Price.....	\$80	85	100	105	110	130	160	185

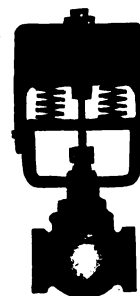
Reversed valves at slight extra charge. See Bulletin 132.

All-metal Valves

Made in all sizes, both single disk and balanced. Direct and reversed acting.

The absolute limit in durability. May be used with the No. 14B Regular in place of the rubber diaphragm valve.

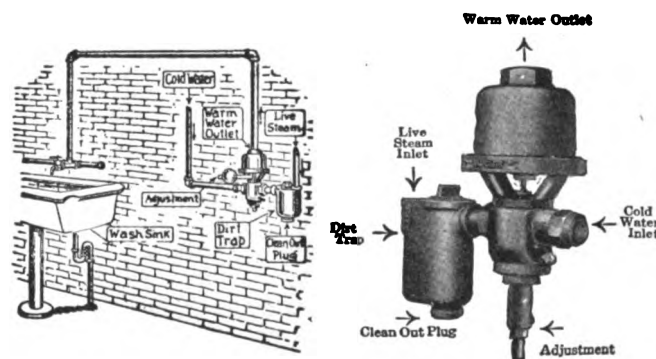
Very desirable where the valve top is exposed to high temperatures. Bulletin 144.



ALL-METAL
VALVE

Instantaneous Steam Water Heater

Thermostatically controlled. For wash sinks, shower baths, etc., in factories, mines, and industrial plants. Heats by mixing steam at 75 lbs. pressure with cold water. No waste. No noise. Bulletin 137A.



INSTALLATION IN WASH SINK INSTANTANEOUS STEAM
WATER HEATER

PRICE LIST INSTANTANEOUS STEAM WATER HEATER

No.	Fittings, in.			Capacity, g. p. m.	Shipping weight, lbs.	Price
	Steam inlet	Water inlet	Water outlet			
1	1 1/4	1 1/4	1 1/4	25	60	\$100
2	1 1/4	1 1/4	1 1/4	40	75	150

RUGGLES-KLINGEMANN MFG. CO.

Manufacturers of a Complete Line of Regulating Valves

MAIN OFFICE AND WORKS

SALEM, MASS.

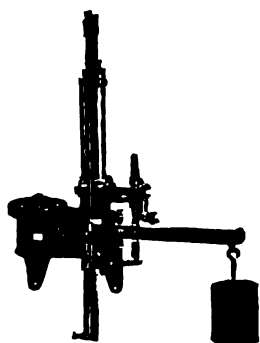
SALES OFFICE: 200 Devonshire Street, BOSTON, MASS.

Products

R-K STEP COMPENSATED FAN ENGINE OF DAMPER REGULATORS; ADJUSTABLE CHRONOMETER VALVES; TEMPERATURE CONTROL REGULATORS.

Also R-K Excess Pressure Boiler Feed Line and Vacuum and Steam Pump Regulators; R-K Valves, including Non-return, Reducing, Float and Balance, Back Pressure and Relief, Atmospheric Relief, Reverse Flow Bleeder Check, Turbine Unloading, and Valves for special purposes; also R-K Cast Iron Exhaust Heads, Excess Pressure Pump Governors and Low Pressure Oil Alarms.

R-K Step Compensated Fan Engine or Damper Regulator



R-K STEP COMPENSATED FAN ENGINE OR DAMPER REGULATOR

The outstanding feature of the R-K is its flexibility, which permits adjustment in the field to meet varying operating conditions. With the R-K, unlike any other regulator, the pressure variation between compensating stages may be varied and the total variation between maximum and minimum stages of travel may be any range from 1 to 10 lbs. This permits regulator to be operated on a comparatively small variation, say a 3-lb. range, or under conditions of a fluctuating load where a wider operating range is needed, say a 10-lb. variation.

R-K Adjustable Chronometer Valves

These valves have many advantages and are fast superseding the ordinary balanced lever valve.

Fig. 30. For fan engine or stoker control. Has rotating plug of Corliss valve type. Fan engine or regulator, when connected to lever, gives a semirotating motion in opening and closing ports. A hand wheel on opposite end may be adjusted to give a lateral motion to plug to close off more or less of port opening. High lift of valve is maintained under all adjustments, but effective area is limited to maximum requirements, making all compensating points of regulator effective, producing smooth operation of fan.



FIG. 30. SECTIONAL VIEW



FIG. 31. SECTIONAL VIEW

Fig. 31. Used in combination with R-K step compensated fan engine or damper regulator for the following service:

Reducing steam or water pressures; controlling speed of reciprocating or turbine driven pumps; unloading constant speed motor driven pumps by closing off more or less of suction; controlling steam to non-condensing



TRADE-MARK

turbines for maintaining a uniform exhaust pressure; controlling steam extracted from a bleeder stage in connection with condensing turbines. Also used with hydraulically operated R-K temperature controllers or for other purposes, except control of fan engines and turbo blowers.

R-K Temperature Control Regulators

Made in two improved types embodying many advantages and a wide range of application.

Type A—Consists of a thermostat motor controller for operating R-K adjustable balanced chronometer valves with or without compensating attachment.

Application—Particularly designed and suited for locations where large valves, from 3 to 12 in., are to be operated through temperature variations. Some common applications are:

Large instantaneous or storage heaters for hot water systems in woolen and worsted mills and dye and finishing plants; temperature control of large storage tanks utilizing surplus exhaust steam; control of large mixing valves; and with compensating attachment to control speed of machines where speed and temperature are related.

Advantages—Elimination of diaphragms, loading springs, double seated valves and compressed air systems. Large positive motion of an adjustable balanced chronometer valve. No leakage from cutting of valves and seats by wire drawing of steam. Adjustment of valve port opening independent of temperature control for radical changes in operating conditions. Compensating attachment of application where a graduated movement is required, functioning from temperature variation such as speed control of engines, motors, etc.

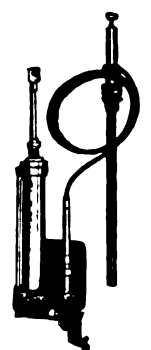
Type B—Consists of a self-contained pilot operated valve, furnished in sizes from $\frac{1}{2}$ to 3 in.

Application—May be applied wherever close control of temperature is desired, within capacity of valves used, for use on dye kettles, dyeing machines, wood scouring bowls, hot water heaters and other industrial applications.

Advantages—No outside operating agency required. Single seated valve with removable seat and disc. Positive motion of valve to full area eliminating wire drawing.

Bulletins

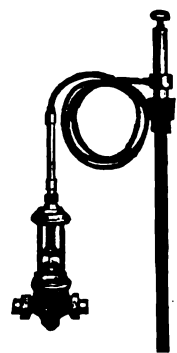
We can furnish complete bulletins covering any of the specialties shown here or listed under products.



Type "A" Non-compensating



Type "A" Compensating



Type "B" Pilot Operated R. K. TEMPERATURE REGULATORS

THE OHIO BODY AND BLOWER COMPANY

Steam and Oil Separators, Steam Traps, Cast Iron Exhaust Heads, Feed Water Heaters

CLEVELAND, OHIO

BRANCH OFFICES

NEW YORK, N. Y., 103 Park Avenue
BOSTON, MASS., 136 Federal Street
DETROIT, MICH., Penobscot Building

BUFFALO, N. Y., 708 Morgan Building
PITTSBURGH, PA., Jones Law Building
CHICAGO, ILL., 318 West Washington Street

INDIANAPOLIS, IND., Board of Trade Building

AGENTS IN ALL PRINCIPAL CITIES

Products

STEAM, OIL, and AIR SEPARATORS.

HYDROMATIC STEAM TRAP.

AIR TRAP.

HYDROMATIC WATER LEVEL CONTROL VALVE.

CAST IRON EXHAUST HEADS.

ALL SERVICE FEED WATER HEATER.

Also manufacturers of Swartwout Metal Buildings; Swartwout Metal Low Temperature Ovens; Swartwout Gas-oil Burners; Swartwout Ship Cows.

For Ventilators, see page 231.



TRADE-MARK
Registered in
U. S. Pat. Off.

The illustrations show the types most frequently required.

Swartwout Oil Separators

Applying the same principle of helico-centrifugal force (*it's the whirl that does the trick*) as in the steam separators, Swartwout oil separators are guaranteed to remove the oil from the exhaust steam so thoroughly that as steam or water of condensation it may be used for heating water by direct contact, feeding boilers and the like.

Swartwout Steam Separators

Centrifugal force is a certain and powerful separator and, as applied in Swartwout separators, does not interfere with the pressure or straight through flow of the steam. The steam is given a whirling motion by the helix and centrifugal force throws the heavy particles of water and oil to the walls of the separator, whence they flow into the large chamber below.

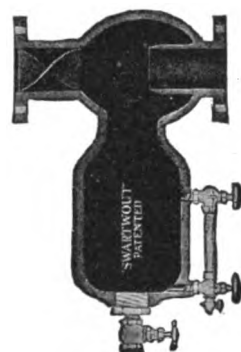
PRICES, STEAM SEPARATORS

Size pipe, in.	Vertical type	Horizontal type	Size pipe, in.	Vertical type	Horizontal type
1½	\$30.00	\$35.00	5	\$85.00	\$105.00
2	35.00	45.00	6	110.00	180.00
2½	40.00	55.00	7	150.00	245.00
3	45.00	60.00	8	185.00	320.00
3½	55.00	70.00	10	315.00	450.00
4	65.00	80.00	12	440.00	590.00
4½	70.00	90.00			

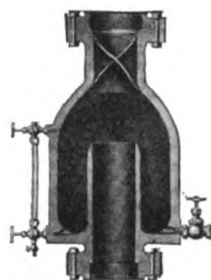
Discounts on application. Prices do not include companion flanges, etc.

For further information, see Catalogue No. 117.

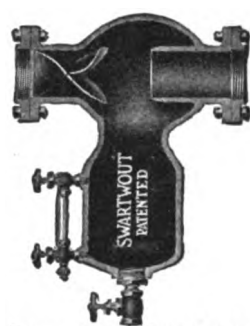
Built in any size for any pressures, Swartwout steam separators give 99% effective separation, and produce commercially dry steam without causing appreciable back pressure.



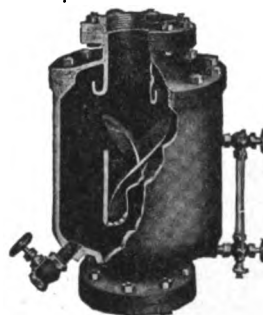
SWARTWOUT HORIZONTAL STEAM SEPARATOR (Patented)



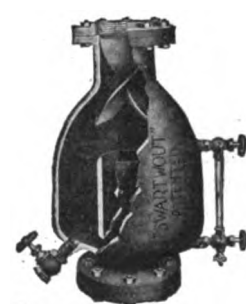
SWARTWOUT VERTICAL STEAM SEPARATOR (Patented)



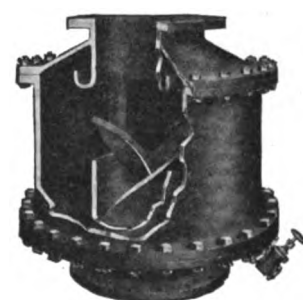
SWARTWOUT HORIZONTAL OIL SEPARATOR (Patented)



12-in. and Smaller



SWARTWOUT VERTICAL DOWN-CURRENT OIL SEPARATOR (Patented)



14-in. and Larger

SWARTWOUT VERTICAL UP-CURRENT OIL SEPARATORS (Patented)

PRICES, OIL SEPARATORS

Size pipe, in.	Vertical up-current and down-current	Standard horizontal	Size pipe, in.	Vertical up-current and down-current	Standard horizontal
1½	\$ 70.00	\$30.00	7	\$160.00	\$140.00
2	80.00	35.00	8	190.00	160.00
2½	85.00	40.00	10	260.00	195.00
3	95.00	45.00	12	360.00	340.00
3½	100.00	50.00	14	515.00	440.00
4	110.00	55.00	16	660.00	545.00
4½	115.00	65.00	18	850.00	630.00
5	120.00	70.00	20	1000.00	770.00
6	135.00	85.00	22	1140.00	945.00

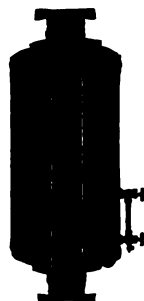
Discounts on application. Catalogues on request.

Prices do not include water gauge, drip valve, nipple and companion flanges and bolts. These can be furnished at additional cost when requested.

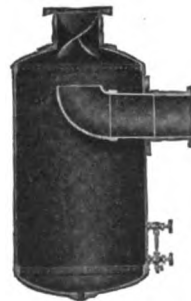
Unless ordered otherwise bolt holes of flanges will straddle vertical center line.



SWARTWOUT VERTICAL ANGLE STEAM SEPARATOR (Patented)



SWARTWOUT RECEIVER TYPE STEAM SEPARATORS (Patented)



Swartwout Air Separator

Air tools, such as hammers, chippers, drills and hoists, must be supplied with air that is as nearly dry as possible. Water in the air lines causes trouble by slugging, knocking, etc., while in cold weather water freezing frequently causes damage.

Experience has shown that one large separator on the main line is inadequate and will not remove all the water and entrainment because the maximum condensation can not be separated at this point. Instead it should be removed from the branch lines near the outlets where the condensation is greatest. For this reason Swartwouts, utilizing the patent helical principle to accomplish maximum separation, have been made in special sizes to be attached at the air connection of each tool. To eliminate all water and entrainment from the air, without any reduction in pressure, attach a Swartwout to each air connection.

These separators are equipped for use with a regular nipple connection on the outlet side of the separator leading to the pneumatic tool.

Dimensions and list prices on Swartwout improved outlet-type separators will be sent on request.

Swartwout Air Traps

Swartwout air traps are indispensable for the proper draining of air lines regardless of the use to which the air is employed. A Swartwout trap will positively collect all condensate, oil or entrainment and discharge it without loss of air pressure. Each trap is fully guaranteed as to material, workmanship and operation.

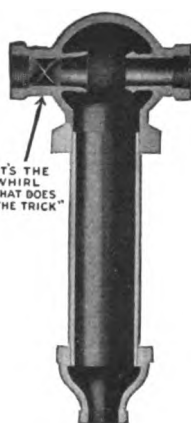
See Swartwout Hydromatic Steam Traps for specifications and prices.

Swartwout Hydromatic Steam Trap

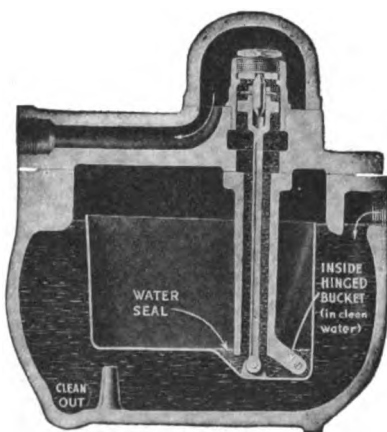
The illustration shows the trap just before discharge. Rising water fills the bucket, causing left side of bucket to drop to post below. The lever action of the hinged bucket on the pull rod opens the discharge valve wide. Steam pressure empties the bucket and buoyancy then lifts the bucket, closing the valve.

The perfect water seal within the bucket prevents steam from passing over, a patented feature exclusive with this trap. The bucket is hinged on the inside. Scale or sediment in the trap body can not clog the hinge, as the swirl of water thoroughly cleans it at each discharge. The presence of only two moving parts reduces wear to a minimum. Valve and seat (reversible) are of monel metal. In the higher pressures the valve is double ended. The action of the valve, being intermittent, removes all chance of wire-drawing.

Design, construction and materials are such that the Hydromatic can be used at all pressures up to 250



SWARTWOUT AIR SEPARATOR (Outlet type)



SWARTWOUT HYDRAMATIC TRAP (Patented)

lbs., merely by substituting interchangeable valves and seats. The Hydromatic is guaranteed to perform up to rated capacity and against defective material or workmanship.

For complete information to be filed, write for Trap Bulletin No. 207 and Steam Specialty Catalogue No. 22 containing full specifications, drawings, installation diagrams of separators, exhaust heads, etc.

CAPACITIES, WEIGHTS AND PRICES, HYDRAMATIC TRAPS

Size, in.	Lin. ft. of 1-in. pipe	Sq. ft. of radiation	Lbs. of water per hour	Weight, lbs.	Price
$\frac{1}{2}$	9000	3000	1000	35	\$18.00
$\frac{3}{4}$	15300	5100	1700	60	22.00
1	18000	6000	2000	90	28.00
$1\frac{1}{4}$	40500	13500	4500	120	35.00
$1\frac{1}{2}$	50400	16800	5600	170	50.00
2	70650	23550	7850	250	70.00
3	124200	41400	13800	435	150.00

All sizes can be fitted with valves and seats suitable for pressures from 0 to 250 lbs. When ordering state the highest operating pressure. If no pressure is specified, traps will be fitted with 150-lb. valves.

Swartwout Hydromatic Water Level Control Valve

Maintains a constant water level in open heaters, tanks, vats, reservoirs, etc.

Controlling valve is opened or closed by its pilot valve controlled by its float. There is no mechanical connection between pilot valve and main inlet. This allows the pilot valve to be placed in any convenient position. The float, rising or falling with the water, opens or shuts the pilot valve, which in turn causes the water to flow through or back up in auxiliary pipe running from main valve to pilot valve. This opens or shuts the hydromatic valve that controls the main inlet.

Water level can not vary more than $1\frac{1}{2}$ in., as that is the full movement of float between wide open and closed positions. In actual practice it is usually less than 1 in.

Pilot valve is of extra heavy, solid brass construction, guaranteed against defects in material or workmanship; no leather washers or packed joints. Seat is ground in and may be easily reseated when worn. Float is the indestructible seamless copper type, making a strictly high grade proposition throughout. Prices on application.

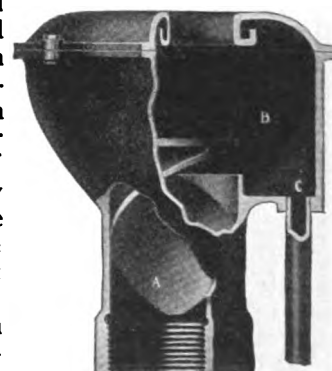


SWARTWOUT HYDRAMATIC WATER LEVEL CONTROL VALVE (Patented)

Swartwout Cast Iron Exhaust Heads

The helico-centrifugal principle is also employed in the Swartwout cast iron exhaust head. The whirling motion given the steam throws the heavy water particles to the walls of chamber "B," where they flow out through drip pipe "C." The result is positive separation without back pressure.

Swartwout cast iron exhaust heads last a lifetime; are light in weight and ornamental from the architectural viewpoint.



SWARTWOUT CAST IRON EXHAUST HEAD (Patented)

PRICES, CAST IRON EXHAUST HEADS

Size exhaust pipe, in.	List price	Size exhaust pipe, in.	List price	Size exhaust pipe, in.	List price
1	\$25.00	5	\$50.00	20	\$360.00
1½	25.00	6	60.00	22	730.00
1½	25.00	7	75.00	24	730.00
2	30.00	8	90.00	26	
2½	30.00	10	115.00	28	
3	35.00	12	155.00	30	On application
3½	35.00	14	190.00	32	
4	45.00	16	230.00	34	
4½	45.00	18	300.00	36	

Discounts on application. Catalogue on request.

Note: Sizes 5 in. and smaller are tapped; larger sizes are flanged. Bolt holes of flanges are drilled to straddle center line of drip outlet on sizes 6 in. and larger. Companion flanges and bolts furnished at extra cost when requested.

Drip pipe should be carried full size to catchbasin or sewer.

service at any time for cleaning or inspection without stopping the engine or in any way interfering with the plant.

The fresh water is controlled by a balanced valve, actuated by means of a self-draining float, which keeps the water at the proper level at all times.

Any excess of water entering the heater, from drips, condensate or leaky valves, will cause the water level to rise to the overflow box, overflow to the trap and thence to the waste pipe.

The Swartwout feed water heater is peculiarly adapted to conditions of continuous plant expansion. It is built like a sectional bookcase and sections can be added from time to time as the power plant grows. It is not necessary to buy a heater that is too big now, to take care of any possible growth. Neither is it necessary to scrap the heater every time a new boiler is bought.

Write today for a detailed description of the heater which "grows with your plant." It is mighty interesting reading.

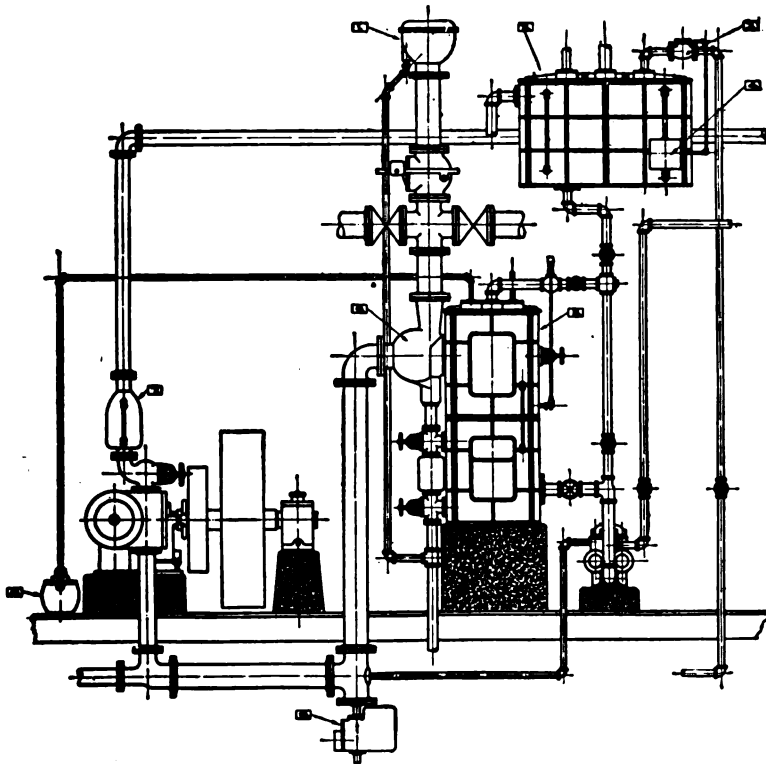
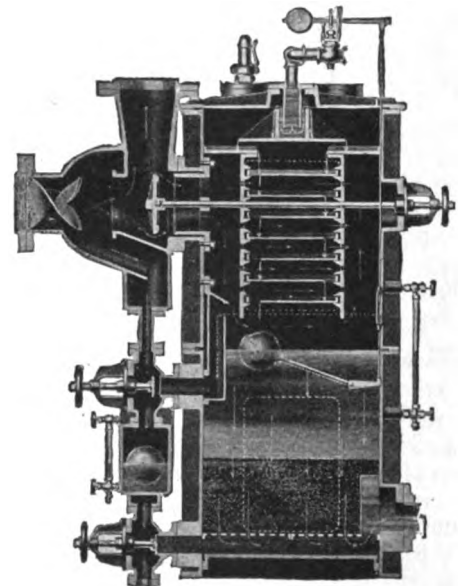
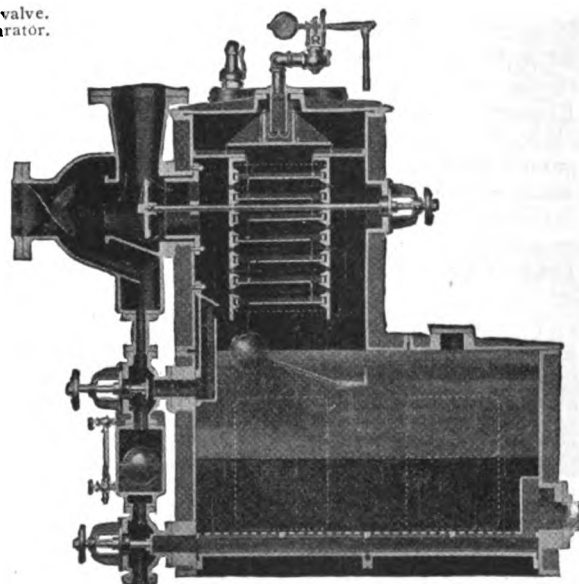


DIAGRAM SHOWING INSTALLATION OF SWARTWOUT APPLIANCES

- (1) Cast iron exhaust head. (2) Receiving tank. (3) Water level control valve. (4) Water regulator. (5) Feed water heater. (6) Oil separator. (7) Steam separator. (8) High pressure trap. (9) Oil trap



Style A, Two Units



Style A, Three Units

SWARTWOUT ALL SERVICE FEED WATER HEATER
Built like a sectional bookcase, it grows with the plant

Swartwout All Service Feed Water Heaters

Designed by a man who has devoted his life to the study and designing of open feed water heaters, the Swartwout has a higher standard of efficiency and economy than ever before attained in a feed water heater. It has many features never before thought possible.

The steam enters the heater through a Swartwout helix oil separator (patented) which imparts a whirling motion to the steam, throwing all oil and condensate against the walls of the separator, where they collect and run down to the trap and thence to the waste pipe. After purification of the steam it enters the body of the heater, where it is deflected downward, passing through and under the trays, completely filling the chamber.

The steam opening into the heating chamber is provided with a cut-out valve of the floating disc type. This valve is opened and closed from the opposite side of the heater. The overflow is also provided with a cut-out valve which, together with the main steam cut-out valve, enables the operator to cut the heater out of

UNITED MACHINE & MANUFACTURING CO.

Manufacturers of Steam Separators

CANTON, OHIO

SALES AGENCIES

BUFFALO, N. Y., LOUIS P. HOLLIDAY, JR., 411 Liberty Building
CHICAGO, ILL., TELKA SALES Co., 11 So. La Salle Street
CLEVELAND, OHIO, L. G. FINLAY, 1836 Euclid Avenue
DETROIT, MICH., L. S. SHAW & Co., Book Building
GRAND RAPIDS, MICH., L. S. SHAW & Co.
INDIANAPOLIS, IND., L. S. SHAW & Co.
LOS ANGELES, CAL., SUTOR & Co., Merchants National Bank Building
WOOSTER, OHIO, STEAM ECONOMICS Co.

NEW YORK, N. Y., ADVANCE ENGINEERING Co., 168 Washington Street
PHILADELPHIA, PA., SHERMAN ENGINEERING Co., Stock Exchange Building
PITTSBURGH, PA., POWER EQUIPMENT Co., Oliver Building
ST. LOUIS, MO., E. M. & W. ENGINEERING Co., 202 Second Street
SAN FRANCISCO, CAL., G. A. FRENKEL & SON., 604 Mission Street
TOLEDO, OHIO, L. S. SHAW & Co.

Product

MOSHER SEPARATOR, for separating water or oil from live steam, exhaust steam, compressed air, ammonia or other gases.

Why the Mosher Separator Is Bone Dry

The steam, in passing through the separator, is caused to revolve many times around the spiral and any foreign matter heavier than the steam is thrown outward by centrifugal force. Acted on again and again, the denser portion is repeatedly shaved off by the overlapping edge of slotted openings through which water, oil or other matter separated is delivered to collecting chamber below. This matter is entirely isolated from currents of steam, air or gas and can not be again picked up and carried along, thus making the passage of steam through the separator free and unobstructed and causing no back pressure.

Specifications of the Mosher Separator

Made in 3 types, the vertical, the angle and the horizontal types; for any desired working pressures per square inch in cast iron, cast steel or steel boiler plate construction, with either small or large collecting chambers.

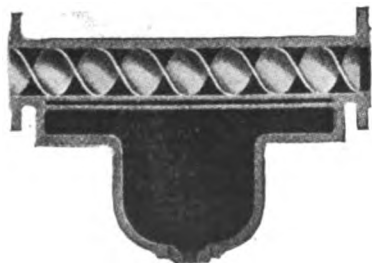
Absolutely self-cleaning, as action of steam continually scrubs the surfaces. Material, workmanship and quick delivery are guaranteed.

Separators of 12-in. pipe size and over will be built up from steel plates for any required size or pressure.

Flanges, unless otherwise specified, will conform to A.S.M.E. extra heavy standard schedule for 1912. Companion flanges and gauge glasses will be furnished with each separator.

Special flanges and fittings will be furnished for ammonia separators at slight additional cost.

Prices on application.



MOSHER HORIZONTAL SEPARATOR
With large collecting chamber for steam or oil separation

Application of the Mosher Separator

The Mosher separator may be used between boiler and engine, between engine and condenser, between high and low pressure cylinders, between reciprocating engines and low pressure turbines, etc.

When used on steam lines to dry houses, etc., it will remove moisture and steam and increase the efficiency. It will separate oil, grit and moisture from compressed air, tar from gas mains, etc.

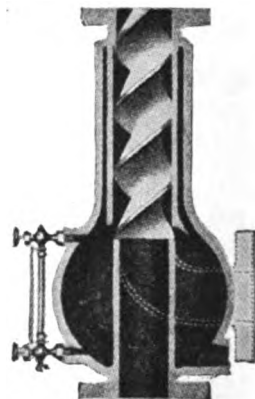
Other uses may be briefly listed as follows: on superheated lines for elimination of water slugs; on vacuum pans and other evaporating apparatus; on long lines of pipe, for ice and refrigerating plants, steam turbines, steam hammers; where steam is supplied from steam mains; as an oil or grease extractor; where quantity of liquid is usually small in proportion to amount of gas; where space is limited; or inside of boiler to overcome priming and for the separation of gasoline from volatile gases, etc.

Guarantee

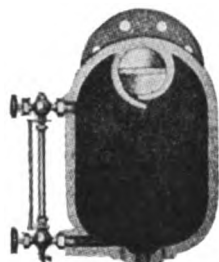
We will guarantee to place the Mosher separator behind any other separator on the market and take out whatever passes the competing machine, or we will place the Mosher separator first and leave nothing for the other machine to extract. We guarantee the Mosher separator to deliver steam, compressed air, etc., containing less than $\frac{1}{2}$ to 1% moisture.

Partial List of Installations

United States Steel Corp.
Republic Iron & Steel Co.
Carbon Steel Co.
Youngstown Sheet & Tube Co.
United Gas Improvement Co.
Central Union Gas Co. of New York
Danville Electric Light Co.
Newark Electric Light & Power Co.
Narragansett Electric Lighting Co.
Public Service Corporation of New Jersey
B. F. Goodrich Co.
Goodyear Tire & Rubber Co.
Firestone Tire & Rubber Co.
Miller Tire & Rubber Co.
United States Rubber Co.
United States Navy
American Sugar Refining Co.
National Sugar Refining Co.
Spreckels Sugar Refining Co.
Pacific Mills
Canadian Pacific Railroad Co.
Pennsylvania Railroad Co.
Ford Motor Co.
General Motors Corp.
General Electric Co.



MOSHER VERTICAL AND
ANGLE SEPARATOR
Built for 200 lbs. working
pressure unless higher pressures are required



CROSS SECTION OF
MOSHER SEPARATOR
Showing spiral and slotted
opening with edge

SARCO COMPANY, INC.

Manufacturers of Steam Specialties

18 Park Place
NEW YORK, N. Y.

BUFFALO, N. Y., 325 Ellicott Square
DETROIT, MICH., 1145 Griswold Street

PHILADELPHIA, PA., Drexel Building
CHICAGO, ILL., Monadnock Block

CLEVELAND, OHIO, 7016 Euclid Avenue
CHICAGO, ILL., Monadnock Block

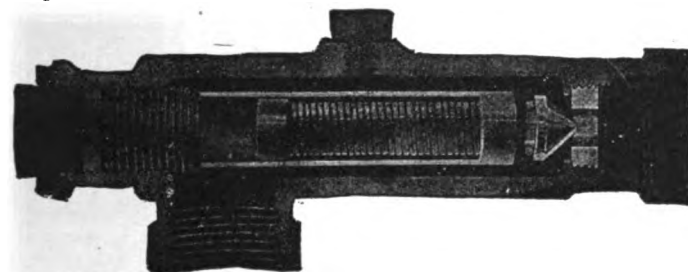
Products

STEAM TRAP SARCO; RADIATOR TRAP SARCO; TEMPERATURE REGULATORS for liquids and atmosphere, for drying ovens and manufacturing processes; SARCO INDICATING and RECORDING THERMOMETERS.

Steam Trap Sarco

Consists of a steam pipe body which can be screwed on to a steam main or pipe anywhere, occupies little space and takes the place of elbow or bend. Inserted in this body is a Sarco cartridge containing an expansible fluid operating a spirally corrugated, hermetically sealed tube, to the lower end of which is attached a piston carrying the valve head.

The trap is put into position, and the cartridge unscrewed a few turns; the steam expands the fluid within the cartridge forcing out the piston, the cartridge is then screwed forward until the valve head meets the seat, closing off the steam. The adjustment is then locked and the trap works automatically. When water collects the liquid contracts, opening the valve; the condensation is then ejected by the pressure behind it and the contact of the steam with the cartridge closes the trap.



DETAIL OF STEAM TRAP SARCO

LOW PRESSURE—0 TO 50 LBS.

Size, in. . .	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3
List prices	\$6.00	6.00	9.45	11.25	24.15	30.00	38.70	51.75	60.00

HIGH PRESSURE—50 TO 200 LBS.

Size, in. . .	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3
List prices	\$7.75	7.75	10.35	12.00	28.50	34.50	48.30	60.00	75.00

Radiator Trap Sarco

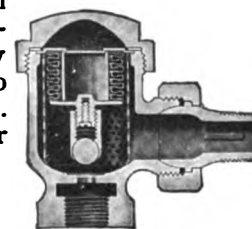
A development of the steam trap Sarco. It uses a spirally corrugated tube of large diameter, which contains a volative liquid and forms the expansion chamber. The diaphragm is directly exposed to steam or vapor insuring quick action. Slight change of temperature within the trap due to condensation gives a wide open movement of the valve.

The valve head of the Sarco is a bronze metal ball freely turning in a socket insuring a perfect seat and providing a very large wearing surface.

The construction of this trap permits the provision of a strainer having 10 times the area of the discharge opening of the trap. This obviates trouble from collection of scale, etc.



The trap is factory adjusted and requires merely to be connected to the radiator and return exhaust line. It will work perfectly on any degree of vacuum and on any steam pressure up to 20 lbs. per sq. in. without strain or adjustment.



DETAIL OF RADIATOR TRAP SARCO

TYPE "E" RADIATOR TRAP SARCO

Size, in.	1/2	3/4
Over all length, in.	3 3/4	3 3/4
Center inlet to face outlet, in.	1 1/2	1 1/2
Center valve to face inlet, in.	2 3/4	2 3/4
List prices.	\$6.00	\$8.00

Sarco Temperature Regulator

These regulators are used to control the temperature of atmosphere and liquids. They use the same thermostatic principle as the steam trap Sarco. They have many advantages over other thermostats, being compact, simple, wholly self-contained and requiring no exterior means of operation. This construction permits a more accurate and constant regulation, reduces installation expenses and eliminates maintenance expense.

Sarco regulators are made in two standard types: KR 14 for room temperature control, and dry kiln work and TR-21 for tank control operating on any given temperature between 30° and 300° Fahr. and can be adjusted by user for any temperature 10° Fahr. above or 10° Fahr. below that for which regulator is calibrated.

Prices on application. Sizes of valves, 1/2 to 6 in.

Sarco Thermometer

The Sarco thermometer is manufactured under the Fournier patents. It is designed for industrial as well as scientific use. It is rugged and substantial in construction and extremely accurate. The dial can be placed at any distance from the thermometer bulb, and the connecting tubing can be exposed to wide temperature differences without affecting the accuracy of the instrument. Practically any desired range from 90° minus to 1300° plus Fahr. can be furnished.

Prices on application.



SARCO TEMPERATURE REGULATOR



SARCO THERMOMETER

WRIGHT-AUSTIN COMPANY

Manufacturers of Steam Equipment

DETROIT, MICH.

NEW YORK, N. Y.

BRANCH OFFICES
CHICAGO, ILL.

BOSTON MASS.

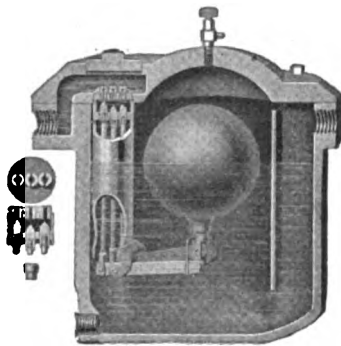
Products

STEAM TRAPS.
BOILER ALARM WATER COLUMNS.
STEAM and OIL SEPARATORS.
Also manufacturers of:
Boiler Feed Water Regulators.
Exhaust Heads.
Air Traps.
Pump Governors.
Strainers.
Automatic Receiver Pumps.

"Emergency" High Pressure 3-valve Steam Trap

By opening wide each valve in turn, as needed, in 1-2-3 order, accomplishes four great advantages in one simple, compact trap:

- (1)—Enormous discharge capacity provided by three valves—equal to more than three ordinary traps.
- (2)—Automatically regulates the trap to any service, whether heavy or light.
- (3)—Eliminates almost entirely the throttling effect and wear on valves and seats.
- (4)—Perfectly adapted for any working pressure up to 200 lbs. without adjustment or change of any parts.



"EMERGENCY" 3-VALVE STEAM TRAP, SECTIONAL VIEW

The trap operates on the principle of three separate units, by putting into service each valve as a unit in succession one after the other, as the amount of condensation requires, whether great or small. Or, all three valves will instantly open wide for "Emergency" slugs or floods of condensation. When the rate of condensation decreases and the water level in the trap recedes, the valves are closed, steamtight, one at a time.

Whether on steam separators, heating coils, drying systems, cooking apparatus, stills or evaporators, the 3-valve trap is 100% efficient. By continuously removing all condensation, the steam is maintained at its highest temperature and the apparatus at top heat.

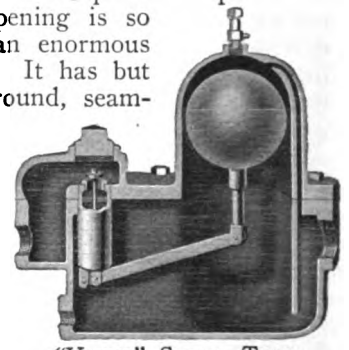
WRIGHT-AUSTIN "EMERGENCY" STEAM TRAP

Trap No.	1	2	3	4	5	6	7	8
Size inlet and outlet, in.	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3
Pressure, lbs.	Maximum discharge in lbs. water per hour							
10	2000	2400	3100	4000	5500	7000	11500	16100
20	2500	3200	4050	5960	7800	10300	16500	22800
30	2900	3700	4800	7000	9300	12400	20200	28000
40	3200	4200	5300	7800	10500	13800	22600	31500
50	3500	4500	5700	8400	11300	15000	24900	34800
75	4000	5100	6400	9500	13100	17400	29200	41000
100	4400	5600	7100	10400	14400	19200	32500	45900
125	4700	6000	7600	11200	15600	20800	35300	49800
150	4900	6300	8100	12000	16700	22400	38000	53700
175	5100	6700	8600	12800	17800	23900	40700	57600
200	5300	7000	9000	13700	19000	25500	43500	61500
Shipping wt., lbs.	70	100	120	140	160	220	260	320
List price.....	\$28.00	32.00	38.00	45.00	63.00	86.00	132.00	150.00

"Victor" Low Pressure Steam Trap, 0 to 20 lbs.

By being designed for low pressure only, the "Victor" is made so simple that dependable operation is assured and its valve opening is so large that it will drain an enormous quantity of condensation. It has but three working parts: a round, seamless, strong copper float; one lever; and one large valve.

It is so designed that the valve opens above the seat. As the incoming condensation fills the trap, the valve is raised above the seat, and it simply overflows, freely and unobstructedly. Straightway pipe connections to body at both inlet and outlet make the "Victor" very simple and inexpensive to install.



"VICTOR" STEAM TRAP, SECTIONAL VIEW

Especially adapted for continuously draining large volumes of condensation from low pressure apparatus, such as heating coils, evaporators, etc. Or, as an oil and grease trap for draining oil separators, because the one large valve is practically the same area as the pipe connection, and will never become choked up.

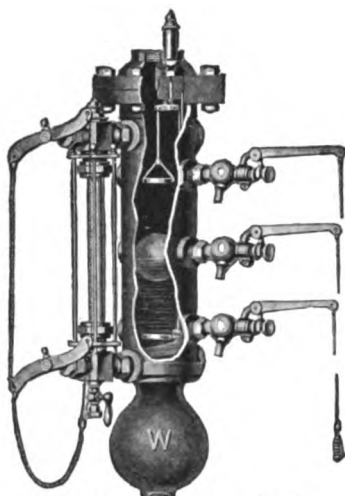
WRIGHT-AUSTIN "VICTOR" STEAM TRAP

Trap No.	0	1	2	3	4	5	6	7	8
Size inlet and outlet, in.	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3
Pressure, lbs.	Maximum discharge, lbs. water per hr.								
1	1125	2020	3040	3700	6880	9550	11400	14580	19920
3	1945	3495	5280	6400	11900	16520	19720	25220	34460
5	2500	4500	6770	8250	15340	21290	25420	32510	44420
10	3540	6360	9575	11650	21670	30080	35910	45920	62745
15	4340	7795	11735	14280	26555	36890	44000	56275	76890
20	5015	9000	13555	16500	30685	42590	50845	65025	88840
Shipping weight, lbs.	45	70	80	100	120	180	200	255	280
List price.....	\$22.00	28.00	32.00	38.00	45.00	63.00	86.00	132.00	150.00

Every trap factory tested before shipment, and fully guaranteed.

Wright-Austin Safety Alarm Water Columns

Wright-Austin alarm water columns have one round seamless high pressure float, one single set of simple integral parts, attached to cover only and removable by simply taking off cover. They are of extra heavy construction for high pressure but designed to operate equally as well under low pressure. Wright-Austin columns are acceptable to all insurance rules and the regulations of every state and city in the United States.



HIGH AND LOW ALARM

DIMENSIONS AND PRICES OF WRIGHT-AUSTIN COLUMNS

Size of column	Kind and size of boiler	Variation between alarms	Price list	
			Without water gage and gage cocks	Water gage and gage cocks
COMBINED HIGH AND LOW WATER ALARMS				
1	36" to 54"	6"	\$28.00	On application
5	56" to 72"	8"	30.00	
7	Water tube	12"	35.00	
9	Others determined by	18"	40.00	
11	natural variation of	24"	42.50	
13	water in boiler	30"	45.00	
15		36"	50.00	
LOW WATER ALARMS				
2	36" to 54"	.....	\$25.00	On application
6	56" to 72"	.....	28.00	
8	Water tube	.....	35.00	

GENERAL DIMENSIONS ALARM WATER COLUMNS

Size of column	Steam and water connections, in.	Blow-off, in.	Water gage, in.	Gage glass, in.	Gage cocks, in.		Center of water connection to top of column, in.	Diameter of column, in.	L'gth over all, in.
					Center	Size			
1	1	3/4	1/2x14	5/8x12	3	1/2	18 1/2	4 1/2	26
5	1 1/2	3/4	1/2x18	5/8x16	4	3/4	21 1/2	5	30 3/4
7	1 1/2	3/4	1/2x21	5/8x19	6	3/4	26	5	34 1/4
9	1 1/2	3/4	1/2x24	5/8x22	9	3/4	30	5	39
11	1 1/2	3/4	1/2x30	5/8x28	12	3/4	36	5	45
13	1 1/2	3/4	1/2x36	5/8x34	10	3/4	42	5	51
15	1 1/2	3/4	1/2x42	5/8x40	12	3/4	49	5	57
2	1	3/4	1/2x14	5/8x12	3	1/2	18 1/2	4 1/2	26
6	1 1/2	3/4	1/2x18	5/8x16	4	3/4	21 1/2	5	29
8	1 1/2	3/4	1/2x21	5/8x19	6	3/4	26	5	34 1/4

*Two glasses joined at center with stuffing box. Four gage cocks.

Wright-Austin Horizontal Oil Separator

For use on exhaust steam lines from engines, pumps, compressors, etc., to remove oil and purify the exhaust steam so that the condensation may be used as distilled water for boiler feed, ice making, textile and chemical processes, etc.



FIG. S. WRIGHT-AUSTIN HORIZONTAL SPECIAL OIL SEPARATOR

FIG. 5. WRIGHT-AUSTIN HORIZONTAL OIL SEPARATORS

Size pipe, in.	Diameter of flanges, in.	Bolt circle, in.	Bolts, number and size, in.	Face to face of flanges, in.	Wide, in.	High, in.	Center of pipe to top, in.	Size drip, in.	Weight, lbs.
1 1/2	Scrd.			9 7/8	12	15 1/2	6 1/2	3/4	60
2	Scrd.			10 1/2	12 1/2	15 1/2	6 5/8	3/4	60
2 1/2	7	5 1/2	4 - 5/8	10 1/2	14 1/2	17 1/2	7 1/8	1	150
3	7 1/2	6	4 - 5/8	10 1/2	15	18	7 1/2	1	165
3 1/2	8 1/2	7	4 - 5/8	11	17	20	8 1/2	1	190
4	9	7 1/2	8 - 5/8	12	19	23	9 1/2	1	235
4 1/2	9 1/2	7 1/2	8 - 5/8	13	21	25	10 1/2	1 1/4	290
5	10	8 1/2	8 - 5/8	15	23	27	11 1/2	1 1/4	370
6	11	9 1/2	8 - 5/8	17 1/2	25	30	12 1/2	1 1/4	475
7	12 1/2	10 1/2	8 - 5/8	17 1/2	27	33	13 1/2	1 1/4	545
8	13 1/2	11 1/2	8 - 5/8	18	29	36	14 1/2	1 1/4	650
10	16	14 1/2	12 - 7/8	19	32	40	16 1/2	1 1/2	855
12	19	17	12 - 7/8	20	34	42	17 1/2	1 1/2	905
14	21	18 1/2	12 - 1	20	36	43	18 1/2	1 1/2	1050
16	23 1/2	21 1/2	16 - 1	22	40	44	20 1/2	1 1/2	1150
18	25	22 1/2	16 - 1 1/8	24	42	46	21 1/2	1 1/2	1375
20	27 1/2	25	20 - 1 1/8	26	44	49	22 1/2	1 1/2	1475

Built in regular patterns up to 48 in.

Sizes 2 1/2 to 10 in., inclusive, built with nozzle flange connections; larger sizes with close flanges and furnished with stud bolts. Eye bolts placed on all sizes above 12 in., inclusive.

Water gages furnished on all sizes except 1 1/2 and 2 in.

Wright-Austin Steam Separators

These are just a few of the many standard Wright-Austin steam separators. Special separators can be designed to suit special conditions. The WRIGHT-AUSTIN COMPANY can always furnish a separator to exactly suit the conditions of any steam installation.

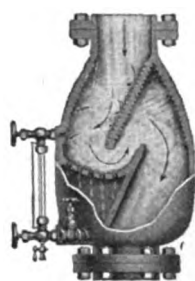


FIG. A. LIVE STEAM VERTICAL IRON SEPARATOR

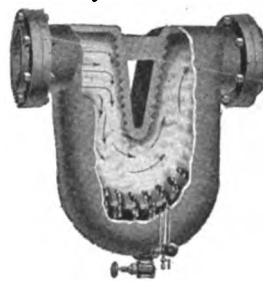


FIG. B. LIVE STEAM HORIZONTAL IRON SEPARATOR



FIG. M. LIVE STEAM VERTICAL IRON SEPARATOR



FIG. E. LIVE STEAM HORIZONTAL IRON SEPARATOR

Figures "A" and "B" Separators are fully capable of handling all the ordinary separator problems. Where more receiver capacity is desired, Figures "M" and "E" can be furnished. Standard and special separators are made with even larger receiver capacity than these. All separators made for both standard and extra heavy pressures and of cast iron or cast steel as desired. Riveted boiler plate separators all built to the rigid requirements of the A.S.M.E. Boiler Code.

WRIGHT-AUSTIN LIVE STEAM SEPARATORS

Size, in.	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	6	7	8	10	12	14
FIGURE "A" VERTICAL														
Flange diam., std., in.	SE	SE	7	7 1/2	8 1/2	9	9 1/2	10	11	12 1/2	13 1/2	16	19	.....
Flange diam., ex. hy., in.	SE	SE	7 1/2	8 1/2	9	10	10 1/2	11	12 1/2	14	15	17 1/2	20 1/2	23
Face to face, in.	11	11	13	15 1/2	16 1/2	18	20	22 1/2	25 1/2	27 1/2	31 1/2	37	40 1/2	44
Weight, lbs.	50	50	95	125	135	160	215	245	315	440	575	910	1000	1100
Drains, in.	1/2	1/2	3/4	3/4	3/4	3/4	3/4	1	1	1 1/4	1 1/4	1 1/2	1 1/2	2
FIGURE "B" HORIZONTAL														
Flange diam., std., in.	SE	SE	7	7 1/2	8 1/2	9	9 1/2	10	11	12 1/2	13 1/2	16	19	21
Flange diam., ex. hy., in.	SE	SE	7 1/2	8 1/2	9	10	10 1/2	11	12 1/2	14	15	17 1/2	20 1/2	23
Face to face, in.	9	9	13 1/2	15 1/2	16	18 1/2	19 1/2	20 1/2	24 1/2	27 1/2	30 1/2	31	36	39
Weight, lbs.	45	45	115	125	165	215	265	285	435	600	835	1135	1545	1625
Drains, in.	1/2	1/2	3/4	3/4	3/4	3/4	3/4	1	1	1 1/4	1 1/4	1 1/2	1 1/2	2
FIGURE "M" VERTICAL														
Flange diam., ex. hy., in.	SE	SE	7 1/2	8 1/2	9	10	10 1/2	11	12 1/2	14	15	17 1/2	20 1/2	23
Face to face, in.	16	16	18	19 1/2	22 1/2	26 1/2	30 1/2	34	37 1/2	42 1/2	48 1/2	58	64	70
Weight, lbs.	35	35	115	145	175	240	315	375	515	665	930	1615	2400	3155
Drains, in.	1/2	1/2	3/4	3/4	3/4	3/4	3/4	1	1	1 1/4	1 1/4	1 1/2	1 1/2	2
FIGURE "E" HORIZONTAL														
Flange diam., ex. hy., in.	SE	SE	7 1/2	8 1/2	9	10	10 1/2	11	12 1/2	14	15	17 1/2	20 1/2	23
Face to face, in.	9	9	13 1/2	15 1/2	16	18 1/2	19 1/2	20 1/2	24 1/2	27 1/2	30 1/2	31	36	39
Weight, lbs.	35	35	155	170	230	310	470	565	715	880	1670	1945	3055	3395
Drains, in.	1/2	1/2	3/4	3/4	3/4	3/4	3/4	1	1	1 1/4	1 1/4	1 1/2	1 1/2	2

WATSON & McDANIEL CO.

Manufacturers of Steam Traps and Regulating Valves

156 North 7th Street
PHILADELPHIA, PA.

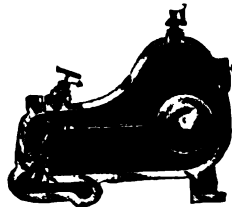
Products

IMPROVED STEAM TRAPS; SIPHON PUMPS; REDUCING VALVES with Lever and Weight; SINGLE SEAT PILOT REDUCING VALVE; ATMOSPHERIC REDUCING VALVE.

Also manufacturers of Pump Governors, Relief Valves, Ejectors, Separators for High Pressure and Exhaust Steam, Hydraulic Valves, Strainers, Suction Tees, and Pressure Regulating Valves.

McDaniel Improved Steam Traps

Will save all the heat and pressure of the steam and discharge the condensation continuously as fast as it reaches the trap, resulting in greatest economy of operation. With large outlet valves, they are not liable to be flooded from sudden flushes of water and are dependable. The weight of the float holds the outlet valve closed. The valve opens in the direction of the flow of condensation. In this construction, we can use heavier floats and larger discharge valves. (See capacities, pounds of water per hour, as this is the only proper way to judge steam trap capacity.) Simple in construction and easily taken care of. Put together with a few bolts conveniently set in slots. The working parts are attached to the bonnet which can be removed without breaking any pipe joints as these are connected to the body of the trap. The water gage shows proper trap operation.



IMPROVED STEAM TRAP

They should be used in all places where condensation collects, draining steam heating apparatus, radiators, coils, coil dryers, dry boxes, vacuum pans, kettles, cooking urns, steam tables, paper calendaring machines; also on bleeders from steam lines and separators, and similar uses where steam drying is done.

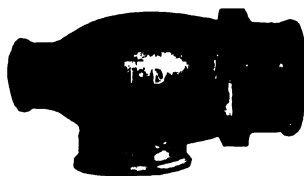
SIZES AND CAPACITIES, IMPROVED STEAM TRAPS

Trap No.	Size, inlet and outlet standard pipe size, in.	Drainage capacity		Capacity lbs. of water per hour, 125 lbs. pressure	Price
		1 in. pipe, lin. ft.	Heating surfaces, sq. ft.		
12	1/2	500	166	1,000	\$ 12.00
13	3/4	1,500	500	3,000	18.00
14	1	4,000	1333	8,000	30.00
15	1 1/4	8,000	2666	16,000	40.00
16	1 1/2	15,000	5000	30,000	60.00
17	2	20,000	6666	40,000	80.00
18	2 1/2	25,000	8333	50,000	100.00

Suitable for steam pressures up to 125 lbs. Also made extra heavy for 125 to 300 lbs. pressure.
Water gages are included with all sizes, except No. 12.

Watson and McDaniel Siphon Pump

Operated by steam pressure for elevating liquids. Will lift 60 ft. with 60 lbs. of steam. Symmetrical in design and small in size, it can be used where saving of space is an object. Is indispensable where tanks are to be pumped out or filled. Needs no

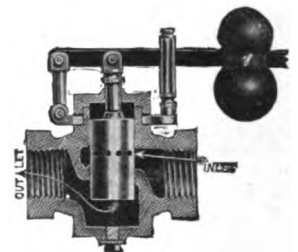


SIPHON PUMP

adjustment, simply connect pipes of proper size and it is ready to work. To start siphon open steam valve. Made in sizes 1/2 to 3 in.

Watson Reducing Valve with Lever and Weight

For steam heating or other places requiring steady low steam pressure on the outlet, valve will adjust itself to feed just enough steam to maintain the pressure wanted. As the valve is controlled entirely by the low pressure side, variations will have no effect on the heating system. Also, if this reducing valve is used to supply steam to a building where one-half of the radiators are in use, and then more are turned on, it will open wider to supply the increased demand for steam, thus insuring steady pressure on low pressure side at all times.



LEVER AND WEIGHT REDUCING VALVE

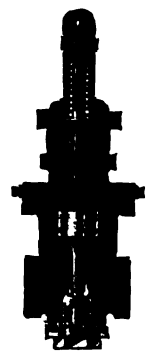
It is solid metal throughout all parts and there is nothing about it to break or give out. Made in sizes 1/2 to 6 in. to reduce steam pressures from 150 lbs. or less to any low pressure desired from 2 to 25 lbs. on the outlet.

Watson Single Seat Pilot Reducing Valve

Made to meet the demands of the higher steam pressures now being used and adapted for places requiring high grade reducing valve. They are extra heavy throughout and all parts are renewable and can be replaced with little trouble.

Consumption of steam from the outlet can be intermittent or constant. One valve can be used for several branch lines if desired and will keep the same reduced steam pressure on each if the valve and pipes are of proper size to supply them.

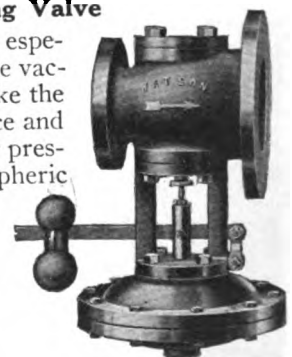
Made in sizes 3/4 to 4 in. for reducing steam pressures from 300 lbs. or less to any desired low pressure, from 5 lbs. up to within 15% of the boiler.



PILOT REDUCING VALVE

Watson Atmospheric Reducing Valve

This valve was designed especially for the requirements of the vacuum heating system. It will take the steam from the boiler and reduce and maintain the pressure on the low pressure heating system at atmospheric pressure or lower, if necessary. It is controlled by a large diaphragm at the bottom and is very sensitive. Made in sizes 1x2 to 6x12 in. to reduce to any low pressure wanted on the outlet from a few ounces to 5 lbs.



ATMOSPHERIC REDUCING VALVE

AMERICAN DISTRICT STEAM COMPANY

Manufacturers of Steam Specialties

GENERAL OFFICE AND WORKS
NORTH TONAWANDA, N. Y.

NEW YORK, N. Y.

OFFICES
CHICAGO, ILL.

SEATTLE, WASH.

Products

Manufacturers of EQUIPMENT, DEVICES, and FITTINGS for the DISTRIBUTION of STEAM or FLUIDS through Underground or Interior Mains, and of the SPECIALTIES used in the Adscos System of Atmospheric Steam Heating, including:

St. John Meter for measuring flow of steam under varying pressures and loads; Rotometer and Simplex Meter for measuring condensed steam or other liquids of low viscosity; Empire Steam Trap for low pressure; American Steam Trap for high pressure; Expansion Joints, single and double; Expansion Joints, duplex sleeve, guided, for high pressure and superheat; Variators; Alignment Guides; Anchor Specials; Pipe Covering; Manhole Covers and Curbs; standard and extra heavy Sweep Angle Fittings; Special Fittings; Service Fittings; Pressure Regulators; Graduated Radiator Valves, and the other Adscos Specialties used in Adscos Heating.

Adscos Duplex-sleeve Guided Expansion Joint with Air-cooled Sleeve

An absolutely new expansion joint for high pressure and superheated steam designed to reduce to a minimum troubles heretofore experienced with expansion joints for high pressure service. The design of this fitting should appeal strongly to all steam engineers.

The duplex sleeve allows a constant circulation of air between the inner and the outer sleeve, keeping the temperature of the outer sleeve considerably lower than the inner. The packing of the slip is against the outer sleeve. Consequently the life of the packing is greatly prolonged.



ADSCOS DUPLEX-SLEEVE GUIDED EXPANSION JOINT

The air-cooled slip is perfectly guided in its traverse, insuring an absolutely straight and true thrust of the slip into the body of the expansion joint, a very important feature.

The outer slip is of steel, accurately machined and ground. Bodies for extra heavy pressures and superheat are of steel.

Can be furnished with either flanged or beveled ends; with or without anchors.

St. John Steam Meter

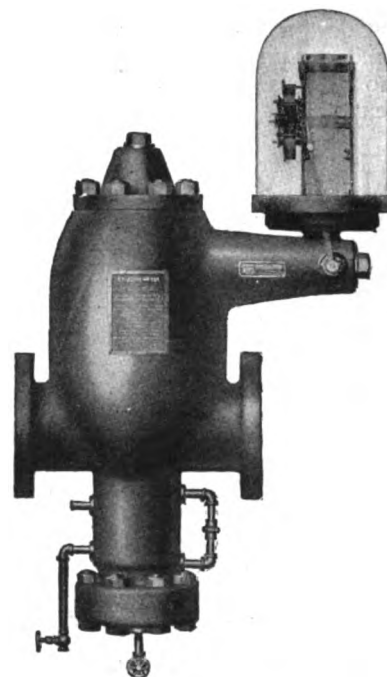
The St. John steam meter is designed for measuring the quantity of steam used in the operation of engines, pumps, blowers, heating systems, drying rooms, and for other purposes. It is of great value in mill and manufacturing plants to determine the power required by the various departments or operations.

The St. John steam meter measures the flow of either saturated or superheated steam at pressures above

10 lbs. and under steady or varying loads. It is simple in construction, has few parts, and its maintenance cost is practically nil. It is largely used also by the purchaser and seller of steam to determine the amount delivered, and is particularly adapted to this purpose for the reason that the chart shows a complete continuous record of the steam used. The only moving part is the valve and spindle which floats in the current of steam. The vertical movement of the valve is transferred to the pointer, which indicates in horsepower the rate at which the steam is being used. At the same time the pencil records the flow of steam on a metallic treated paper ribbon operated by clockwork at a speed of $\frac{1}{2}$ in. per hour.

All meters have flanged ends and are furnished faced and drilled, A. S. M. E., extra heavy, unless otherwise ordered.

In Ordering Meters—State the purpose for which each is to be used, as well as the minimum and maximum quantities of steam to be measured, the steam pressure, degree of superheat, if any, and whether for use where flow will be steady or fluctuating.



ST. JOHN STEAM METER

Size in.	Capacity at 100 lbs. pressure, b.h.p.	Size in.	Capacity at 100 lbs. pressure, b.h.p.
1	27	4B	250
1½	55	5A	330
2	70	5B	440
3	110	6A	775
4A	165	6B	1000

Catalogues and Bulletins

Complete Catalogue No. 21 covers all of the devices and equipment listed under "Products."

If interested in the economical heating of a community or group of buildings from a single steam-generating plant, ask for Bulletin No. 20 on Central Station Heating and for Bulletin No. 158 describing the Adscos System of Atmospheric Steam Heating for individual buildings. This system can be installed for 15% to 20% less than most other heating systems and effects a saving in fuel cost of 20% to 30%.

The services of our Engineering Department are available without charge for the promotion of any proposition dealing with the transmission or distribution of steam.

ESTABLISHED 1841

E. B. BADGER & SONS CO.

Manufacturers of Expansion Joints for High and Low Pressure

63-75 Pitts Street
BOSTON, MASS.

SALES OFFICE: 101 Park Avenue, NEW YORK, N. Y.

Products

BADGER SINGLE and SELF-EQUALIZING CORRUGATED COPPER EXPANSION JOINTS.

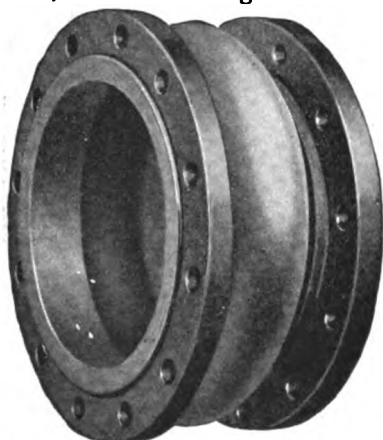
For Water Cooling Systems, Strainers and Air Washers, see page 612.

**Badger Single Corrugation Expansion Joints**

Badger single corrugation expansion joints are made for connection between turbines and condensers and designed for any special requirements, particularly to take care of vibration and a very slight amount of expansion.

A great many joints of this type have been made in all sizes up to 84 in.

The company has facilities for manufacturing any joint of this type that may be required, whether its shape is round, oval or rectangular.

**BADGER SINGLE CORRUGATION EXPANSION JOINT**

FACE TO FACE DIMENSIONS IN INCHES

Size	Single corrugation	Size	Single corrugation
4	7	26	16
6	7	28	16
8	9	30	16
10	10	36	16
12	10	42	16
14	10	48	16
16	12	54	18
18	12	60	18
20	12	66	18
22	12	72	18
24	12	84	18

Badger Self-equalizing Expansion Joints

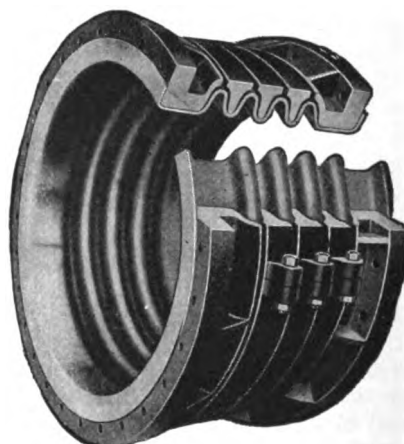
The Badger self-equalizing expansion joints are made of seamless copper tubes, of the best quality Lake copper, which is known to be the most ductile metal used in commercial engineering work. They are properly designed and rolled, with deep corrugations; and with the aid of the cast iron or steel equalizing rings, conforming to the shape of the corrugations, they take care of the changes in length in the pipe line, due to temperature changes, in a most efficient and economical manner: (1) because they are a one-piece joint and never require packing, and, (2) because the corrugations are designed and rolled to stand repeated

changes of shape and to care for a required amount of expansion on each corrugation.

The external equalizing rings equally distribute the expansion over each corrugation, thus eliminating the possibility of a fracture in the copper, due to the fact that one or two corrugations take care of the total amount of expansion.

They also give the added strength to the copper to resist pressure.

Self-equalizing expansion joints are made with: 2 corrugations to care for 1-in. expansion; 4 corrugations to care for 2-in. expansion.

**BADGER SELF-EQUALIZING EXPANSION JOINT**

FACE TO FACE DIMENSIONS IN INCHES

Size	Two corrugations	Four corrugations
6	12½	19
8	12½	19
10	12½	19
12	13	20
14	13½	20
16	13½	20
18	14	21
20	15	21½
22	15	21½
24	15½	22

Special Features of Badger Joints

Badger expansion joints are:

Simple—there are no complicated parts.

Durable—made of best quality copper.

Safe—given a hydraulic test on every joint.

Convenient—installed as easily as any pipe fitting.

Compact—greatest diameter usually less than flange.

Efficient—they require no packing.

When Ordering Badger Joints

State (1) size of pipe; (2) whether steam, water, gas or air-line; (3) working pressure; (4) length and material of pipe; (5) face to face dimensions; (6) range of temperature; (7) how often heat is turned on or off; (8) whether subject to superheat; (9) outside diameter of flanges, diameter of bolt circle, number of bolts, diameter of bolt hole.

Catalogue

Write for catalogue No. 13.

BADGER FIRE EXTINGUISHER CO., INC.

EXPANSION JOINT DEPARTMENT

175 Portland Street
BOSTON, MASS.

NEW YORK OFFICE: 123 William Street

Product

BADGER COPPER EXPANSION JOINTS.

For Badger Fire Extinguishers and 40-gallon Chemical Engines, see page 257.

Types

Badger self-equalizing joints for high and low pressure for expansion only.

Single corrugation joints for pressure and exhaust, to absorb vibration and not over $\frac{1}{2}$ -in. expansion.

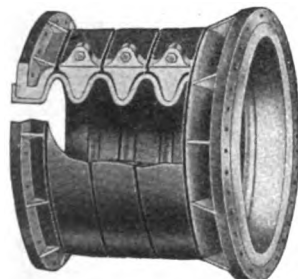
Single and multiple corrugated joints for turbine and other connection.

Special exhaust joints, oval and rectangular, any size.

Specially constructed joints for close connections and joints used for filling in pieces as well as for vibration and expansion.

Badger Self-equalizing Expansion Joints

Made from a single, seamless copper tube, deeply corrugated, flanged at each end and reinforced with high tensile cast iron rings, so shaped as to limit the amount of expansion to be absorbed by each corrugation. They are accurately fitted at the point of bearing between the corrugations and serve as reinforcing bands, adding materially to the strength of the joint. It is to be observed that all parts of the joint are banded with iron except the corrugations, practically constituting each



SELF-EQUALIZING EXPANSION JOINT

corrugation a tube capable of withstanding a pressure of 2000 to 3000 lbs. A joint is thus formed allowing perfect freedom of action with a proportionate amount of expansion on each corrugation, carrying a large factor of safety, very elastic and flexible. They require no attention after installation; no packing boxes to keep tight; saving loss from steam leakage and services of a mechanic to keep in working condition.

FACE TO FACE DIMENSIONS AND WEIGHTS, BADGER SELF-EQUALIZING EXPANSION JOINT

Diam. pipe, in.	Length face to face, in.	Approx. weight, lbs.	Diam. pipe, in.	Length face to face, in.	Approx. weight, lbs.
1 $\frac{1}{4}$	18 $\frac{1}{2}$	42	8	19	290
1 $\frac{1}{2}$	18 $\frac{1}{2}$	47	10	19	390
2	18 $\frac{1}{2}$	53	12	19	490
2 $\frac{1}{2}$	18 $\frac{1}{2}$	56	14	20	570
3	18 $\frac{1}{2}$	64	16	20	670
3 $\frac{1}{2}$	18 $\frac{1}{2}$	82	18	21	750
4	18 $\frac{1}{2}$	91	20	21 $\frac{1}{2}$	900
5	18 $\frac{1}{2}$	114	22	21 $\frac{1}{2}$	1048
6	19	235	24	22	1168

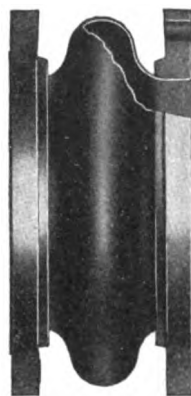
Special Points of Superiority in the Badger Self-equalizing Expansion Joints

- (1) Made of a single, seamless copper tube with

deep corrugations, requiring no attention or labor on glands or stuffing box to keep tight.

- (2) Takes care of vibration as well as expansion.
- (3) Each joint, with its collared flanges and equalizing rings, reinforces the copper sleeve, greatly adding to the strength of the joint—acting like hoops on a barrel.
- (4) Successful service given in actual use.
- (5) Relieves all strain on pipe joint fittings.
- (6) Installed as easily as any flange, valve or fitting.

Single Corrugation Copper Expansion Joints



SINGLE CORRUGATED COPPER EXPANSION JOINT

These joints have a use peculiarly their own and can be used for either pressure or exhaust work. Primarily they are used for exhaust service as between turbine and condenser and for work where practically but little expansion takes place, and where there is likely to be more or less vibratory motion. Under such conditions a single deep corrugation joint is of great value in relieving the strain and giving freedom of motion between fittings. Expansion joints are constructed to resist a vacuum and are good for pressures up to 25 lbs. They are usually fitted with American standard low pressure flanges, but can be furnished with flanges to suit conditions of installation.

FACE TO FACE DIMENSIONS AND WEIGHTS, SINGLE CORRUGATION COPPER JOINTS

Diam. pipe, in.	Length face to face, in.	Approx. weight, lbs.	Diam. pipe, in.	Length face to face, in.	Approx. weight, lbs.
4	6	34	26	14	490
6	6	48	28	14	550
8	8	79	30	14	600
10	9	108	36	14	800
12	9	150	42	14	1000
14	9	185	48	14	1350
16	11	230	54	16	1850
18	11	260	60	16	2400
20	11	320	72	16	3200
22	11	350	84	16	4400
24	11	370			

Specifications for Ordering Badger Self-equalizing Expansion Joints or Other Types

- (1) Diameter of pipe and material.
- (2) Whether for steam, liquid or gas.
- (3) Working pressure.
- (4) Range of temperature.
- (5) Amount of expansion to be cared for.
- (6) How often system is turned on or off.
- (7) Whether subject to superheat.
- (8) Complete specifications of flanges.
- (9) Plan or sketch with inquiry will help materially in determining the requirements.

Write for Catalogue E.

AMERICAN METALLIC PACKING CO.

Manufacturers of Metallic Packing

MAIN OFFICE

Mexico Avenue, N. S.
PITTSBURGH, PA.

Product

METALLIC PACKING for air, steam, gas, ammonia, and gas engine rods.

American Metallic Packings

Are made for packing any steam, air, gas, gaseous ammonia or gas engine rods working under any condition or pressure, whether high or low, condensing or non-condensing, or when using superheat. It is suitable for packing any valve stem, reciprocating or oscillating.

The rings of American metallic packing are made of vanadium cast iron, which is the best wearing metal available for the purpose, except where a large volume of water enters the cylinder, in which case the rings are hydraulic bronze. The retainer, or cage, which houses the rings is made up of either the solid or split type of cage, that can be made to fit in or out of the stuffing box. There is no fibrous packing or rubber rings used in connection with American metallic packing. When the outside type is ordered and there is ample room between the face of the stuffing box and the nearest point on the cross head, it is unnecessary to remove the soft packing gland. A joint should be cut to go between the face of the stuffing box and the gland and it can be pushed into place.

The outside type packing bolts against this.

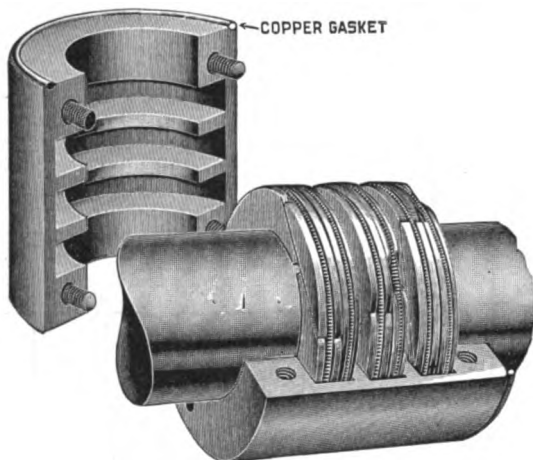


FIG. 1. PACKING CAGE (INSIDE SPLIT)
No. 29 Rings

Fig. 1 shows our inside split type of packing which fits inside of stuffing box. This style is used in connection with soft packing gland. It can be removed from stuffing box at any time by using two draw bolts which can be screwed into same to pull it out. Style of ring shown is our type No. 29.

We do not recommend type No. 10 rings for this style of application.

Fig. 2 illustrates our most popular style of packing cage. This is furnished when other styles are not specified. It can be applied without disconnecting any part of the engine, and bolts on the outside face of the stuffing box.

The style of ring shown is our type No. 10,

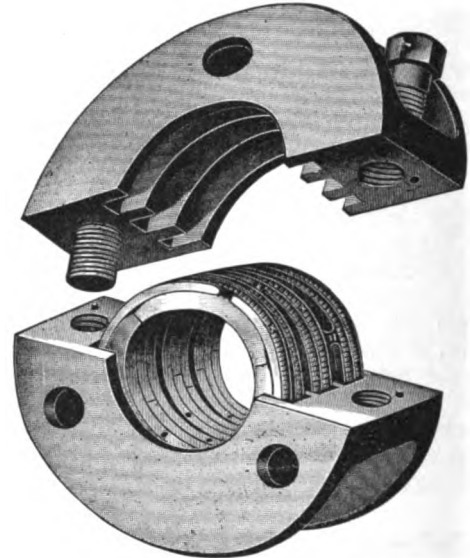


FIG. 2. PACKING CAGE (OUTSIDE SPLIT)
No. 10 Rings

although there are different types of rings manufactured by us, any of which will fit this retainer or cage. This packing requires approximately $3\frac{1}{4}$ in. along the rod on 5 in. rods or less, and $4\frac{1}{4}$ in. on larger rods.

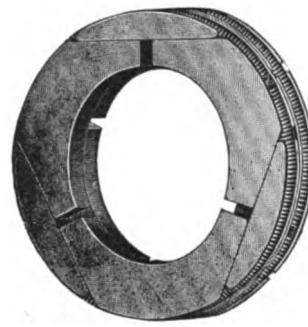


Fig. 3. Type No. 29 rings will work on steam, air, gaseous ammonia, or gas rods. We recommend this ring for all vertical rods, and for horizontal rods up to 12-in. diameter



Fig. 4. No. 10 rings are intended for all large rods excepting those on vertical engines. This ring will hold on steam, air, gas or gas engine rods, with the exception that for gas engine rods they are held in position by elliptic instead of spiral springs

AMERICAN METALLIC PACKING RINGS

Special Packings

We make a special packing for pressures ranging from 300 to 1200 lbs. The rings in same are self-balancing and do not come in contact with the pressure. If you have a high pressure air compressor, give this packing a trial for 90 days.

Guarantee

Every order is accepted with the understanding that the packing is to have a trial of 90 days before acceptance. Should it prove unsatisfactory, return it at the expiration of the trial at our expense.

THE AMERICAN METAL HOSE CO.

Manufacturers of Metal Hose and Tubing

WATERBURY, CONN.

SALES OFFICES

NEW YORK, N. Y., 173 Lafayette Street
PITTSBURGH, PA., Union Bank Building

BOSTON, MASS., 201 Devonshire Street
CHICAGO, ILL., 29 East Madison Street

CANADIAN SELLING AGENT: LYTLE ENGINEERING CO., LTD., MONTREAL, CANADA

PACIFIC COAST AGENT: F. SOMERS PETERSON Co., SAN FRANCISCO, CAL.

Products

AMERICAN FLEXIBLE METAL HOSE and TUBING.

Description

American flexible metal hose is exactly what the name would imply, a hose made from metal, a flexible pipe. It is manufactured in a number of different patterns, the underlying principle of all of them being the same. A continuous strip of metal is first rolled into the desired shape, then wound spirally over itself, a packing of asbestos or some form of cord fed into the groove during the winding process making it pressure-tight.

While supplied for all classes of work, metal hose is primarily a hard-service proposition, and for all the heavy duties we furnish what is the best known of the various patterns we make—"Interlocked Construction," style BD15.

Use

For oil, steam, air, gas, gasoline, paint, varnish, etc.

We recommend metal hose particularly for use where rubber hose can not be expected to last.

Steam Hose

American metal steam hose is our BD15 bronze; it is not affected by steam at highest pressures, bends as readily as rubber hose and will last indefinitely longer. This hose is offered for any high pressure, hard service work, where non-corrosive metal is necessary.



Oil Hose

American metal oil hose is our BD15 steel. Oils and oil products have absolutely no effect on it.

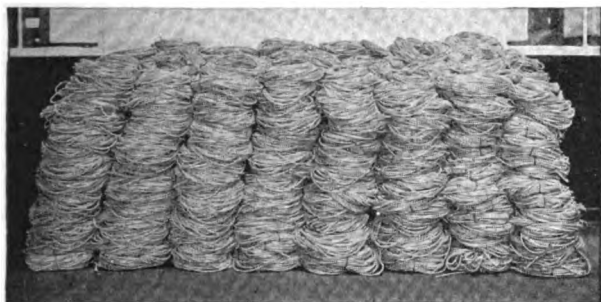
We can supply flexible metal oil hose in all sizes from 1/4-in. inside diameter which is used as feed line on machine tools to the 8-in. inside diameter hose employed in loading and unloading crude oil.

The United States Navy uses flexible metal hose exclusively for the handling of steam and oils.

The test pressures in the accompanying table are from present United States Navy specifications on flexible metal hose and are used by us as standard.

BD15 AMERICAN METAL HOSE

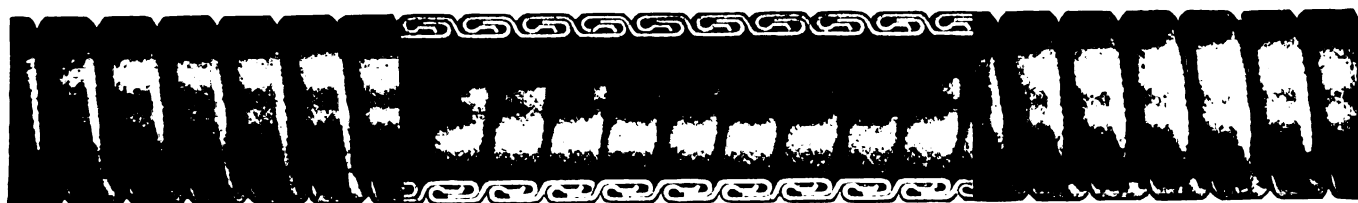
Diameters of hose, in.		Approximate bending diameter, in.	Weights, per foot, lbs.	Test pressures per sq. in., lbs.	
Inside	Outside			Straight	Bent
1/4	1 1/4	4	.11	500	400
3/8	1 1/2	6	.25	500	400
1/2	1 3/4	7	.40	500	400
5/8	2	12	.80	500	400
3/4	2 1/4	14	1.00	500	400
1	2 1/2	18	1.50	400	300
1 1/4	3	22	1.75	400	300
1 1/2	3 1/4	26	2.75	300	200
2	4	32	3.15	250	150
2 1/2	4 1/4	38	4.50	250	150
3	5	44	6.75	200	75
4	6 1/4	50	8.75	200	75
5	7 1/4	56	11.00	150	75
6	8 1/4				



150,000 FT. OF FLEXIBLE METAL TUBING READY FOR SHIPMENT



UNLOADING OIL TANK CAR WITH AMERICAN METAL HOSE



SECTION OF 3/4-IN. BD15 INTERLOCKED HOSE

BAILEY METER COMPANY

2019 East 46th Street
CLEVELAND, OHIO

BOSTON, MASS.

NEW YORK, N. Y.

PHILADELPHIA, PA.

PITTSBURGH, PA.

CHICAGO, ILL.

BAILEY METER COMPANY, LIMITED, MONTREAL, QUE., CAN.

Products

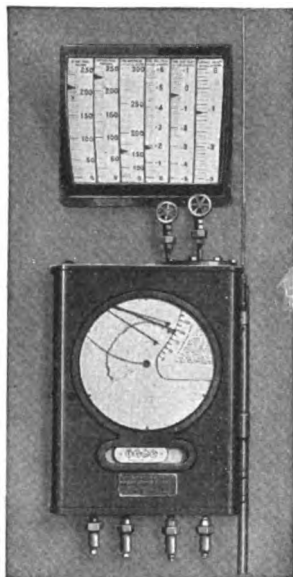
METERS: Steam, Boiler, Water, V-Notch Weir, Coal, Air, Gas; **ASH PIT LOSS RECORDERS;** **MULTI-POINTER GAGES** for Draft, Pressure and Temperature; **SPECIFIC GRAVITY RECORDERS.**

Also manufacturers of Tachometers and Differential Recorders.

All manufactured under the trade-name "BAILEY."

Boiler Panel

This panel contains a multi-pointer gage and a boiler meter, making an ideal combination for boilers having stokers of the underfeed type. Additional units are added to the gage as required to indicate pressures in the different compartments of forced draft chain grate stokers.



BAILEY BOILER PANEL

Consisting of Bailey Multi-pointer Gage, Type P6F, and Bailey Boiler Meter, Type D26, Class 59

All of the important facts are recorded on a single 12-in. uniformly graduated chart, while those of lesser importance are indicated on 10-in. illuminated scales. All of the data is brought to one point so that the operator can make needed adjustments intelligently and see the results instantly.

The boiler meter records and totalizes steam flow, records air flow, flue gas temperature and coal feed. This gives all the information required for keeping a continuous efficiency record of the boiler.

The multi-pointer gage indicates steam pressure, feed water pressure and flow, wind box pressure, fire box draft and up-take draft all on appropriate scales.

Bailey Fluid Meters

Bailey meters use a thin plate Monel metal orifice placed between a pair of existing flanges in the pipe line. It can be inserted the same as a gasket without changes in the existing piping, except to drill and tap for the meter connections on each side of the flange.

The Bailey orifice serves the same purpose as a Venturi tube, but is simpler to install as no change in piping is required, and it is accurate over a wider range of capacity for measuring steam, water, air or gases. The pressure loss is small; consequently there is no cutting action on the orifice, and accuracy is maintained over long periods of time.

A variable area bell sealed in mercury produces a record on a 12-in. uniformly graduated 24-hour chart reading directly in thousands of pounds per hour or other desired units. This bell has ample power for accurately moving an integrator without the use of

cams or other troublesome mechanism and gives totals directly in pounds, gallons, cubic feet, or other desired units.

The capacity of the meter is readily changed by exchanging orifices and the meter can be used for portable work or it may be permanently piped to two or more orifices in different steam or water lines and switched from one to the other by manipulating the valves.

The meters record and totalize the flow of high and low pressure steam, exhaust steam, feed and service water.



BAILEY FLUID METER
Type C2, Class 24. Records and totalizes flow records pressure and temperature

Bailey Boiler Meters

These meters record steam flow, air flow and flue gas temperature and may be supplied with coal feed recorder, steam temperature recorder or other useful recorded results essential to the operation of stoker and boiler.

The Bailey Boiler Meter not only checks the work of the fireman, but helps him to know whether he is obtaining maximum efficiency and desired capacity at all times, so that he can immediately make any changes necessary to correct faulty conditions.

Steam Flow—The mechanism previously described is used to record the steam flow from the boiler. It usually reads in per cent of boiler rating, but may read in horsepower or in thousands of pounds of steam. A totalizer may be added reading directly in thousand-pound units, and the evaporation of each boiler obtained if accurate means of measuring the coal are provided.

Air Flow—The air flow portion of this meter is adjusted, after practical tests, to read the same as the steam flow, so long as the proper amount of air is being supplied for most efficient combustion. Excess air causes the air flow reading to exceed the steam flow while a deficiency of air is shown by the air flow reading being less than the steam flow.

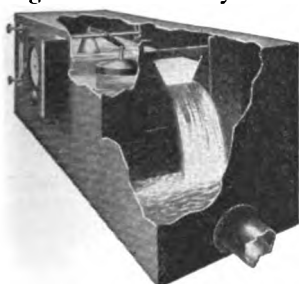
When the steam flow and the air flow records are together it indicates that the fuel bed is in good condition and a flue gas analysis would show the highest CO₂ content possible for minimum loss due to CO or incomplete combustion. When the fire is maintained in this condition, any reasonable capacity may be obtained from the boiler by increasing or decreasing the rate of air supplied.

Flue Gas Temperature—Dirty tubes and poor baffles are often the cause of more loss of heat in the average power plant than is the improper supply of air. With the flue gas temperature recorded on the same chart with the rate of steam flow and air flow, the effect of the rate of steaming and air excess can be eliminated and the heat absorbing efficiency of the boiler directly determined.

The Bailey Flue Gas Temperature Recorder is unique in that it gives a true average temperature of all the gases leaving the boiler, even where 24 ft. or more in width. It may be heated to 1200° Fahr. without damage and is free from sources of error common to most recorders.

Bailey Weir Meters

The V-Notch weir offers many advantages for the measurement of water and certain other liquids at or near atmospheric pressure. The flow curve is such that greater accuracy can be obtained over a wider range than with any other type of meter.



BAILEY WEIR METER
Type F4

The flow is recorded on a uniformly graduated chart without the use of cams or other complicated mechanism. The totalizer records the total flow on a four-dial counter reading in pounds, gallons or cubic feet, as desired.

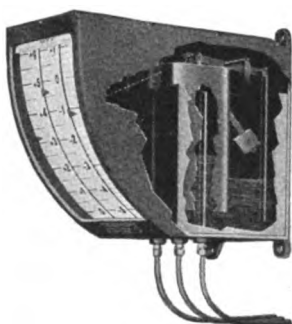
When required, a record of the water temperature may be made on the same chart.

Bailey Multi-pointer Gages

These gages were developed to supply the demand for a sensitive and accurate draft gage. As shown by the illustration, the design is practically the same as that of the firebox draft indicator which has been used on boiler meters for several years.

The draft or pressure is applied to the interior of an oil sealed bell which is balanced by a counterweight rod on the opposite end of the beam. The force produced by the draft is balanced by a pendulum weight. The construction is such that changes in the temperature or level of the oil do not decrease the accuracy.

All of the pointers have 10-in. motion, over illuminated scales graduated so that accurate readings may be made at a distance of 20 ft. The gage is furnished in any number of pointers up to 10 or 12, and is convenient and easily read even in the dark on account of the self-illuminated scale. Steam and other high pressures, temperatures, speeds and other factors can be indicated on this type of gage.



INTERIOR OF THREE-POINTER
GAGE

Bailey Ash Pit Loss Recorder

The use of this recorder gives a continuous record of the percentage of heat lost in unburned coal passing over the end of the chain grate stoker to the ash pit. The recorder bulb placed at the back of the bridge wall, is warmed by the radiant heat from incandescent coke passing over the end of the grate, causing a rise in temperature which is recorded on the chart directly in per cent heat lost.

Bailey Meters for Coal and Granular Material

This meter is designed to meet the demand for a device that will meter crushed coal, ore and other granular materials in large quantities.

The counter is self-illuminated and has large figures so that they can be read at a distance of 50 ft. The counter may be connected with flexible shafting so that it may be located at a distance from the vane in the pipe.

This meter gives accurate and consistent results when installed in a vertical pipe under proper conditions. It is built to withstand hard usage and as there is no external power required it will operate with a minimum of attention.

Bailey Gas Meters

These meters record, and may also totalize, the rate of flow of gases and read directly in thousand cubic feet per minute or per hour, as desired. The chart used is 12 in. in

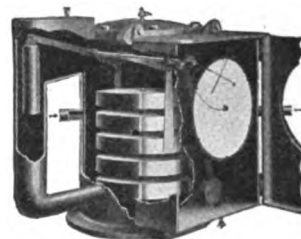


BAILEY GAS METER

diameter and uniformly graduated with the proper scale so that the meter reads directly without the use of factors. These meters are designed for the measurement of gas and compressed air at any pressure up to 300 lbs. They may be supplied with pressure and temperature recorders so that a complete record of any varying condition is obtained. They can also be supplied with a compensating device which automatically corrects the totalizer readings for variations in pressure.

Specific Gravity Recorder for Liquids

The actual specific gravity of a continuous sample is recorded on a 12-in. uniformly graduated chart in any desired units. It can be designed for any required range as 0.80 to 1.00, 1.10 to 1.50 or even as small a range as 1.000 to 1.020, reading directly in specific gravity degrees Baume, per cent sugar or other desired units.



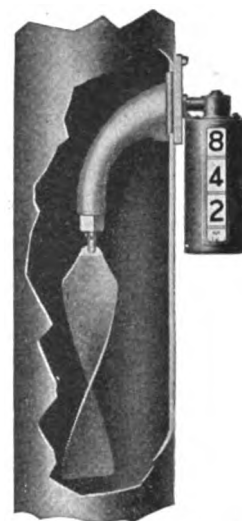
SPECIFIC GRAVITY RECORDER

Other Types

Many other types of meters and recorders are built for meeting special conditions so that we are in a position to assist you in the solution of any metering problems.

We have offices in the principal cities and our engineers cover most of the country. They are always glad to make a survey of any plant and submit suggestions for an installation of meters that will prove profitable. This will be done without any obligation on your part.

This company not only sells meters but maintains a force of engineers for rendering services both before and after meters are installed.



BAILEY METER FOR
COAL AND GRANU-
LAR MATERIAL

BUFFALO METER CO.

Manufacturers of Oil Meters, Water Meters and Water Meter Accessories

2915 Main Street
BUFFALO, N. Y.

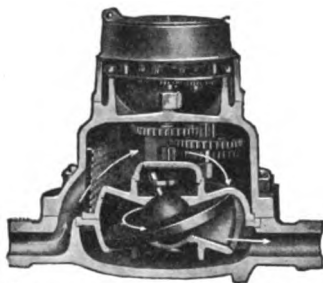
Products

OIL METERS, WATER METERS, HOT WATER METERS.
Also manufacturers of Portable Testing Water Meters; Gasoline Meters; Jet Meters for regulating flow to flush tanks; Curb Boxes for extension dial meters; Lock Boxes for enclosing $\frac{5}{8}$ -in. meters; Sealable Up-right Pipe Meter Connections, Meter Reading Books, Office Meter Record Books.

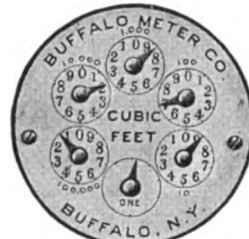
Niagara and American Water Meters

Niagara and American water meters are of the disc type and have only one grade and model of working parts, but four differently constructed outside casings.

The Niagara meter has the outer casing made of a fine grade of cast iron, carefully galvanized. When a Niagara meter is frozen, one-half of the outer case usually breaks, thus relieving the inner and more expensive parts from injurious strain. The American meter has the main outer casing made of bronze with either a galvanized cast iron base, a bronze base or a breakable galvanized cast iron frost bottom.



SECTIONAL VIEW $\frac{5}{8}$ -IN. METER



ROUND READING REGISTER

The works are carefully made on the interchangeable plan from bronze composition, hard brass, hard rubber, and nickel bronze; they are protected by an internal strainer. The measuring chamber is of large capacity and is fitted with a strong reinforced hard rubber measuring disk. All submerged bearings are protected against sand and sediment.

The meters may have either round reading or straight reading registers indicating cubic feet, gallons or liters at buyer's option.

GROSS PRICE LIST, NIAGARA AND AMERICAN WATER METERS

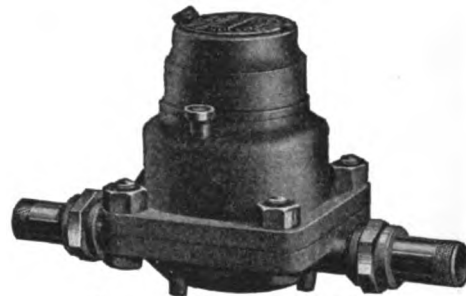
Size of meter, in.	Greatest proper capacity, U. S. gals. per min.	Niagara Meter only with all-galvanized iron outside case	American Meter only with bronze main case and galvanized iron base	American Meter only with all-bronze outside case	American Meter only with bronze main case and breakable frost bottom	Brass couplings per pair, extra
$\frac{1}{2} \times \frac{1}{2}$	20	\$ 16.00	\$ 18.00	\$ 20.00	\$18.00	\$1.00†
$\frac{3}{4} \times \frac{3}{4}$	20	16.00	18.00	20.00	18.00	1.50†
$\frac{1}{2}$	34	24.00	27.00	30.00	27.00	1.50†
1	53	35.20	39.60	44.00	39.60	2.20†
1 $\frac{1}{4}$	75	48.00	54.00	60.00	.....	3.00
1 $\frac{1}{2}$	100	64.00	72.00	80.00*	.....	4.00
2	160	96.00	108.00	120.00*	.....	6.00
2 $\frac{1}{2}$	240	140.00	157.50	175.00	.....	8.75
3	315	240.00	.....	.....	.....	Flanges
4	500	400.00	.....	.....	.....	no charge.

†In these sizes, quarter bent couplings may be furnished at the following prices per pair: $\frac{1}{2}$ -in., \$1.50; $\frac{3}{4}$ -in., \$2.00; 1-in., \$3.00.

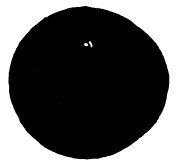
* $\frac{1}{2}$ -in. and 2-in. all-bronze case meters may be furnished with internal standard pipe threads when specially ordered.

Niagara Oil Meters

Niagara oil meters are used to measure fuel oil, lubricating oil, gasoline and oils of all kinds. They will operate by pump or gravity pressure of 1 lb. or more per sq. in. and with oil at any temperature.



OIL AND HOT WATER METER



STRAIGHT READING REGISTER

The register is all-metal straight reading type indicating U. S. gallons, imperial gallons or liters. Each meter is tested and adjusted to measure within 1% of absolute accuracy at its rated capacity.

GROSS PRICE LIST, NIAGARA OIL METERS

Meter No.	*Capacity for continuous rates of flow per hour, U. S. gals.	†Size and kind of pipe connections	List prices
A	6 to 300	$\frac{1}{2}$ -in. unions	\$20.00
B	10 to 500	$\frac{1}{2}$ - or $\frac{3}{4}$ -in. unions	20.00
C	30 to 1000	$\frac{3}{4}$ - or 1- in. unions	30.00
DV	60 to 2000	1- or 1 $\frac{1}{4}$ -in. unions	44.00
EV	90 to 3000	1 $\frac{1}{4}$ - or 1 $\frac{1}{2}$ -in. unions	60.00
FV	120 to 4000	1 $\frac{1}{2}$ -in. unions	80.00
F	175 to 6000	1 $\frac{1}{2}$ - or 2-in. unions	120.00
G	250 to 9000	2- or 2 $\frac{1}{2}$ -in. unions	160.00
G	250 to 9000	3-in. flanges	200.00
IV	350 to 13000	3-in. flanges	240.00
JV	500 to 18000	4-in. flanges	400.00

For all sizes of Niagara oil meters with large vertical dial add to these list prices \$20.00.

* These minimum quantities are the smallest rates of flow which the meters should be expected to measure accurately. The maximum quantities are the highest rates of flow for continuous operation without undue wear. Meters used only occasionally may be safely operated on flows twice the maximum quantities.

†The size of meter required is not determined by the size of pipe on which it is to be set, but by the flow to be measured. To facilitate setting on different sizes of pipes each meter may be furnished with either of the two sizes of openings and connections listed.

Niagara Hot Water Meters

The Niagara hot water meter is similar in design to the Niagara oil meter, but has works of special construction to run in water at any temperature up to 250° Fahr.

GROSS PRICE LIST, NIAGARA HOT WATER METERS

Meter No.	Capacity according to h.p. of boilers	†Size and kind of pipe connections	List prices
B	8 to 20 h.p.	$\frac{1}{2}$ - or $\frac{3}{4}$ -in. unions	\$20.00
C	10 to 40 h.p.	$\frac{3}{4}$ - or 1- in. unions	30.00
D	25 to 90 h.p.	1- or 1 $\frac{1}{4}$ -in. unions	44.00
EV	40 to 150 h.p.	1 $\frac{1}{4}$ - or 1 $\frac{1}{2}$ -in. unions	60.00
E	50 to 200 h.p.	1 $\frac{1}{2}$ - or 2-in. unions	80.00
F	80 to 325 h.p.	1 $\frac{1}{2}$ - or 2- in. unions	120.00
G	150 to 600 h.p.	2- or 2 $\frac{1}{2}$ -in. unions	160.00
G	150 to 600 h.p.	3- in. flanges	200.00
Battery 2-3 in.	300 to 1200 h.p.	4- or 6-in. internal threads	450.00

For all sizes of Niagara hot water meters with large vertical dial add to these list prices \$20.00.

†The size of meter required is not determined by the size of pipe on which it is to be set, but by the flow to be measured. To facilitate setting on different sizes of pipes each meter may be furnished with either of the two sizes of openings and connections listed.

BUILDERS IRON FOUNDRY

The Venturi Meter Department

PROVIDENCE, R. I.

BRANCH OFFICES AND REPRESENTATIVES

NEW YORK, N. Y. PHILADELPHIA, PA., CHICAGO, ILL.
LOS ANGELES, CAL., GRINNELL Co. ATLANTA, GA., E. F. Scott & Co.
SAN FRANCISCO, CAL., N. B. LIVERMORE & Co. PORTLAND, ORE., NORTHWESTERN EQUIPMENT Co.
TORONTO, ONT., CAN., ALLEN GENERAL SUPPLIES, LTD. OTTAWA, ONT., CAN., GENERAL SUPPLY Co.

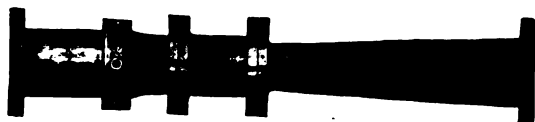
Products

VENTURI METERS for liquids, gases, steam, etc.; VENTURI RATE OF FLOW CONTROLLERS.

Also manufacturers of Venturi Chemical Feed Regulators; Loss of Head Gauges; Water Level Recorders; Barometric Type Mercury Manometer for testing work; Type Q S Register for air and gas; Effluent Controllers and Gauges for filtration plants, etc.

Venturi Meter Tube

A Venturi Meter Tube is placed in a pipe line in the same manner as ordinary pipe. From the inlet to the throat the interior diameter gradually decreases and then gradually increases again to the full diameter at the outlet. The unrestricted passageway thus formed permits high differential pressure between inlet and throat with minimum friction loss. Annular pressure chambers are provided at inlet and throat. The throat is lined with bronze. Connection to the indicating, recording or registering instrument is simply made by two small pipes, one from the inlet and one from the throat chamber.



VENTURI METER TUBE

*STANDARD VENTURI METER TUBES AND CORRESPONDING MEASURING RANGES FOR WATER

Diameter of pipe, in.	Catalogue No.	Length of meter tube, ft.	in.	Pounds per hour		Gallons per minute	
				Minimum	Maximum	Minimum	Maximum
2	2 1/2	1	1 1/2	1360	17600	3	35
	2 1/2	1	10 1/4	1960	25400	4	55
	21	1	7	3470	45100	7	90
3	31	2	11	3470	45100	7	90
	31 1/2	2	7 1/2	5420	70400	11	140
	31 1/2	2	4 1/2	7820	102000	16	205
4	41 1/2	4	3 1/2	5420	70400	11	140
	41 1/2	3	10 1/2	9170	119000	18	240
	42	3	6	13900	181000	28	360
5	51 1/2	5	1 1/2	9170	119000	18	240
	52	4	8 1/2	13900	181000	28	360
	52 1/2	4	2	21700	282000	44	565
6	62	5	11	13900	181000	28	360
	62 1/2	5	4 1/2	21700	282000	44	565
	63	4	10	31300	406000	63	810
12	124	11	0	55600	722000	110	1440
	125	9	11	86900	1129000	175	2260
	126	8	10	125000	1626000	250	3250
24	248	21	2			445	5780
	2410	19	0			695	9020
	2412	16	10			1000	13000
36	3612	31	4			1000	13000
	3615	28	1			1560	20300
	3618	24	10			2250	29300
48	4816	41	6			1780	23100
	4820	37	2			2780	36100
	4824	32	10			4000	52000

* Intermediate sizes of water tubes with intermediate capacities are omitted from this table. See Bulletin 210 for complete list.

SWEET'S CATALOGUE



TRADE-MARK
Name Registered
U. S. Pat. Off.

Type M Register-Indicator-Recorder

This machine has the advantage of unusual ruggedness and extreme accuracy.

The Type M furnishes three distinct kinds of information: it indicates momentary rate of flow through the meter tube; permanently records this rate upon a large circular chart; gives the total quantity on a circular counter dial. Each register is graduated for the particular meter tube with which it is to be used.

For cold and hot water and other liquids, high pressure gases, steam, etc. Universally employed for main water supply lines, boiler feed, hot water heating systems, and many other important kinds of service.



TYPE M REGISTER-INDICATOR-RECORDER

Type M Indicator-Recorder

The lower dial is 10 in. in diameter and indicates the rate of flow (pounds per hour, gallons per minute, etc.) through the Venturi Meter Tube. The upper dial records this rate continuously on a large circular chart. The interior mechanism is simply and positively actuated through large cast iron floats, resting on mercury columns, and rack and spur gearing.

The total quantity may be obtained by tracing the charts with a special planimeter manufactured by BUILDERS IRON FOUNDRY.

The Type M Indicator-Recorder may be used for the same kinds of service as the Type M Register and is also frequently employed for temporary installations at various points where it is desired to study the consumption or output through certain main pipe lines, or the efficiency of operation of important plant units.



TYPE M INDICATOR-RECORDER

Bulletins

Bulletins describing the Venturi for hot and cold water, sewage, brine, chemical solutions, oil, gas, air or steam sent on request.

YARNALL-WARING COMPANY

Manufacturers of Yarway Steam Specialties

7604 Queen Street
CHESTNUT HILL, PHILADELPHIA, PA.

BRANCH OFFICES AND REPRESENTATIVES

ATLANTA, GA.
BOSTON, MASS.
CHICAGO, ILL.
CINCINNATI, OHIO

CLEVELAND, OHIO
DENVER, COLO.
DETROIT, MICH.
EL PASO, TEX.

HOUSTON, TEX.
MONTREAL, QUE.
NEW ORLEANS, LA.
NEW YORK, N. Y.

PHILADELPHIA, PA.
PITTSBURGH, PA.
ST. PAUL, MINN.
SAN FRANCISCO, CAL.

SYRACUSE, N. Y.

Products

YARWAY-LEA V-NOTCH RECORD-
ING LIQUID METER.

YARWAY SEATLESS BLOW-OFF
VALVE.

YARWAY DOUBLE-TIGHTENING BLOW-OFF VALVE.

YARWAY ADJUSTABLE SPRAY HEAD.

YARWAY BOILER SKIMMER.

YARWAY HYDRAULIC VALVE.

YARWAY PIPE JOINT CLAMP.

YARWAY HOLTITE PIPE CLAMP.

YARWAY AIR COMPRESSOR UNLOADER.

YARWAY STEAM TRAP.

YARWAY

TRADE-MARK

A Yarway Meter keeps the plant in a state of continuous test. Faulty firing methods are shown up at once. Serious trouble is forecast so quickly that accidents may often be prevented

and repairs made before a shutdown is necessary.

Measures continuously without interrupting or retarding any process.

More than 2000 Yarway-Lea meters in use in all parts of the world for measuring "water rate" in turbine plants, boiler feed water, make-up water, blow-down and heating system returns.

Hundreds of Yarway-Lea meters are being used in connection with feed water heaters.

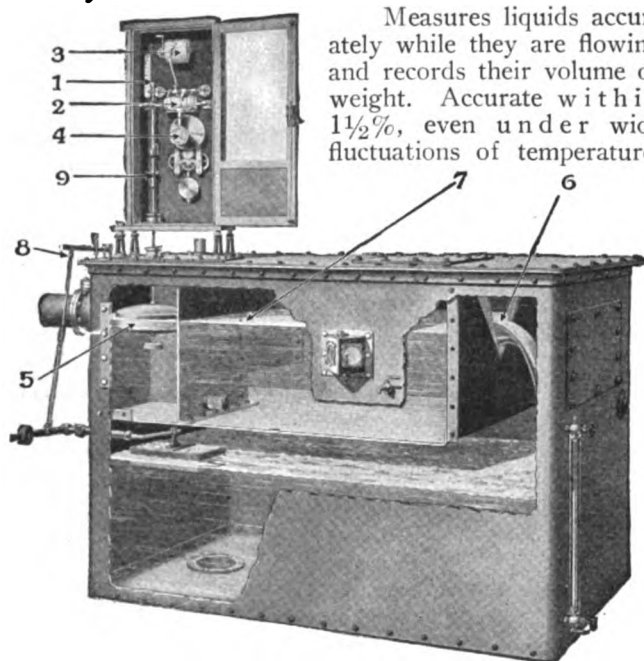
Meter and recorder may be set on a different level from the measuring tank, either a floor above or below, or at another part of the same floor near a common instrument board.

Hundreds more Yarway-Lea meters are being used to record the flow of water for municipal and irrigation systems, and also to measure and record the flow of liquids in manufacturing processes where definite quantity of liquid has to be measured while it flows.

Measuring without interrupting or retarding the work not only increases production but lowers manufacturing costs.

Write for Bulletin L-40, which describes advantages, mechanism, parts, and tanks.

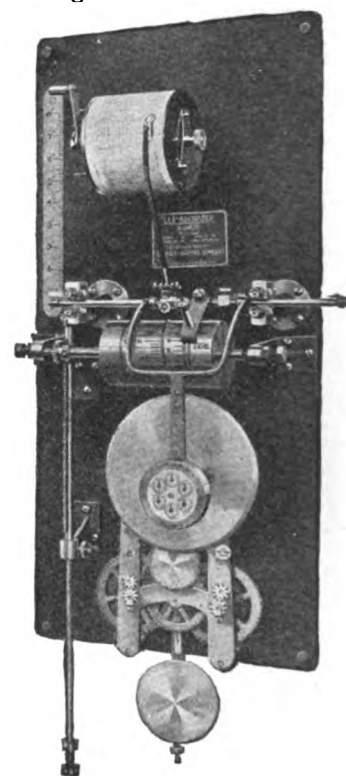
Yarway-Lea V-Notch Meter



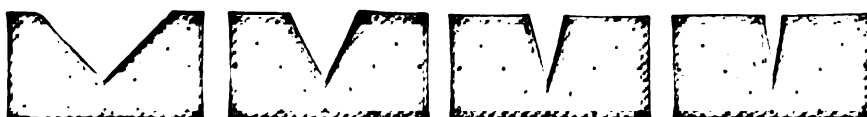
Measures liquids accurately while they are flowing and records their volume or weight. Accurate within 1½%, even under wide fluctuations of temperature.

YARWAY-LEA V-NOTCH METER

Liquid is admitted through control valve 8 to weir chamber 7. As level of liquid rises and falls, flowing through V-notch 6, float 5 connected to rackrod 9 also rises and falls, indicating flow in inches of head on scale 1, simultaneously showing rate of flow in pounds or gallons on cam drum 2, with permanent graphic chart record for any period of day on 24-hour chart 3. Integrator 4 gives record of total quantity of liquid handled since starting operation



YARWAY-LEA RECORDER



DIFFERENT SIZES OF NOTCHES USED TO REGULATE FLOW THROUGH METER

Yarway Seatless Blow-off Valve

No seat to leak. Nothing to cut or clog. Full, free opening through the valve. Packing is protected from action of the blow-off and is automatically compressed when the valve is closed. Many Yarway Seatless Blow-off Valves have been in constant service 7 and 8 years without being repacked. Gradual opening—no danger of waterhammer.

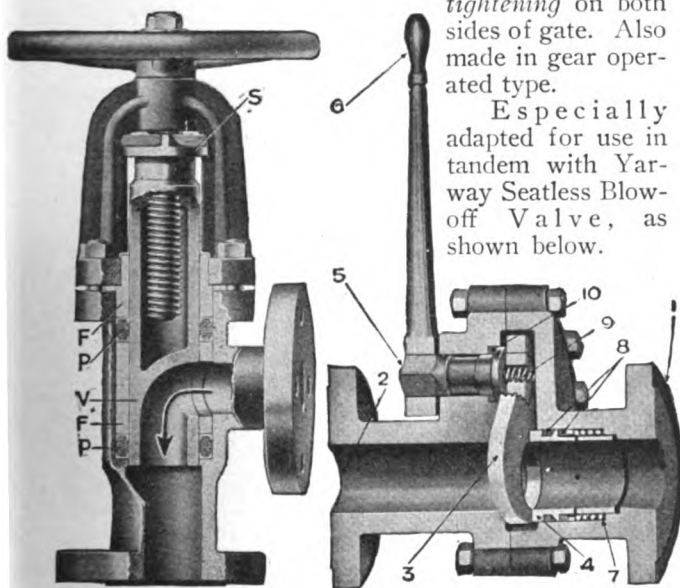
Made both angle and straightway, screw or flange, extra heavy throughout and finished with all-iron, bronze mounted, or all-bronze body—for land or marine service.

The standard blow-off valve in thousands of large plants in the United States and Canada.

Yarway Double-Tightening Blow-off Valve

A quick opening valve of lever operated, swing gate type, with unique feature of sealing bushing on inlet side, making it *double tightening* on both sides of gate. Also made in gear operated type.

Especially adapted for use in tandem with Yarway Seatless Blow-off Valve, as shown below.

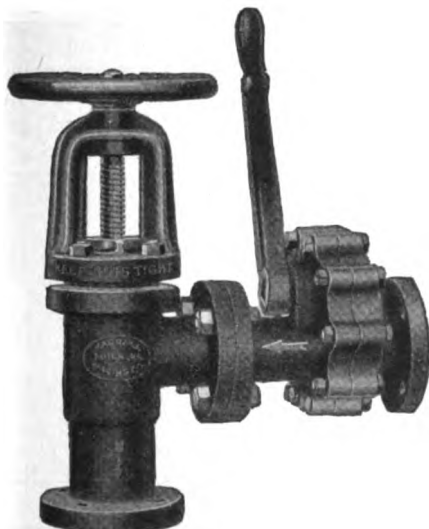


YARWAY SEATLESS BLOW-OFF VALVE

In closing valve, shoulder S on plunger V engages the loose follower gland F, compressing packing P above and below the port, making an absolutely tight valve.

YARWAY DOUBLE-TIGHTENING BLOW-OFF VALVE

- | | |
|---------------------|------------------------|
| (1) Body | (7) Sealing bushing |
| (2) Cap | (8) Sealing bushing |
| (3) Disc | (9) Stem spring |
| (4) Sealing bushing | |
| (5) Stem | |
| (6) Lever | (10) Stem packing ring |



YARWAY SEATLESS BLOW-OFF VALVE AND YARWAY DOUBLE-TIGHTENING BLOW-OFF VALVE IN TANDEM ARRANGEMENT

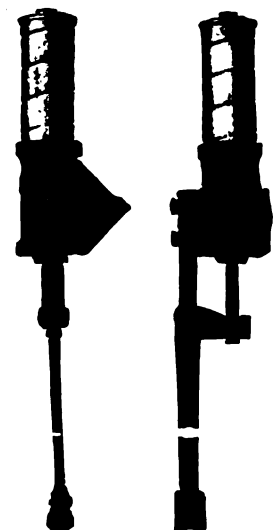
Yarway Adjustable Spray Head (C. C. Thomas Patents)

A simple, unique, efficient spray head for use on cooling ponds, or wherever a liquid needs to be cooled rapidly.

Adjustable to any rate of flow or pressure, to varying atmospheric and temperature conditions.

Can be flushed out by operating levers from shore.

Many ponds have been equipped with Yarway Spray Heads in the United States and other countries.



YARWAY ADJUSTABLE SPRAY HEAD

Yarway Boiler Skimmer

A successful device for the removal of scale-forming matter from the water in the boilers.

It is based on the thermal principle of circulation in heated water.

Leading plants are securing greatly increased steam power from boilers equipped with the Yarway Boiler Skimmer.

Fifteen tons of solid matter removed from 7 boilers in one large plant in one year.

Bulletin S-1201A gives full information and may be had for the asking.



YARWAY BOILER SKIMMER

Yarway Hydraulic Valve (Caskey Patents)

A short lever, quick acting, easily operated valve, designed for high pressure work from 500 to 5000 lbs. per sq. in. The greater the pressure the tighter the valve. Can be repacked. Thousands in use in many industries.

Yarway Pipe Clamps

For stopping pipe line leaks completely, permanently, and in short time—the Yarway Pipe Joint Clamp for leaks at joints, the Holtite Pipe Clamp for leaks in straight sections. Either requires but a few minutes to apply. More than 25,000 sold.

Yarway Air Compressor Unloader (Richards Patents)

A power saver for the motor driven air compressor. Simple, automatic, cool running and long wearing. Hundreds in successful service for years.

Yarway Steam Trap

A simple, effective trap, suitable for pipe lines of any length.

Bulletins and Information

All Yarway specialties are described at length in different folders and bulletins which will be sent for the asking.

SIMPLEX VALVE AND METER COMPANY

5720 Race Street
PHILADELPHIA, PA.

REPRESENTATIVES

BOSTON, MASS., GEO. W. STETSON, 141 Milk Street
CLEVELAND, OHIO, A. MACLACHLAN, 876 Rockefeller Building
CHICAGO, ILL., MAHER ENGINEERING Co., 30 N. Michigan Boulevard
PITTSBURGH, PA., JOHN D. HILES Co., 1722 Oliver Building

KANSAS CITY, MO., T. C. MCFARLAND, Mutual Building
MINNEAPOLIS, MINN., L. E. POLLARD Co., 423 Fifth Street, South
SAN FRANCISCO, CAL., WATER SUPPLY & EQUIPMENT Co.
TORONTO, CAN., FRANCIS HANKIN & Co.

Products

INDICATING, RECORDING and TOTALIZING METER REGISTERS for use with Venturi Tubes, Pitot Tubes, Weirs and Orifices; BOILER FEED WATER METERS.

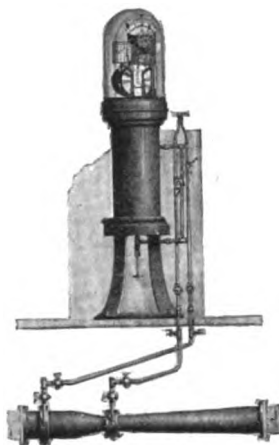
Also manufacturers of Rate of Flow Controllers, Direct and Indirect Acting Types, for mechanical, slow sand and pressure filters; Loss of Head and Rate of Flow Gages, Indicating, Recording and Combined Types, for filter plants; Indicating and Recording Elevation Gages; Water Level Recording Gages for water wheel plants; Portable Pitot Tube Chart Recorders for water waste surveys; Manometers for use with Venturi tubes and Pitot tubes; Automatic Air Valves for pipe lines; Combined Air and Vacuum Poppet Valves for large mains; Altitude Valves, Mercury or Float Operated, special design eliminates water hammer; Chemical Feeding Devices for both low head and pressure services.

Simplex Meter Register

This is the simplest indicating, recording and integrating device made for use with Venturi tubes for the measurement of water, sewage and other liquids. The meter measures flow accurately down to one-twentieth of its maximum capacity.

The indicating dial has uniform spacing for all rates of flow. The indicating dial and recording chart are customarily graduated in gallons per 24 hours, and the totalizing mechanism in gallons. They may, however, be graduated in any units desired.

The Simplex Venturi tube meter register is extensively used for checking up reciprocating pump performance and determining slippage, for measuring delivery of centrifugal pumps and figuring station efficiency, for distributing proportionately the cost of the water supplied to the several districts, for recording daily amounts of sewage handled and planning future extensions, etc.



SIMPLEX VENTURI TUBE
METER REGISTER



SIMPLEX PORTABLE RECORDER

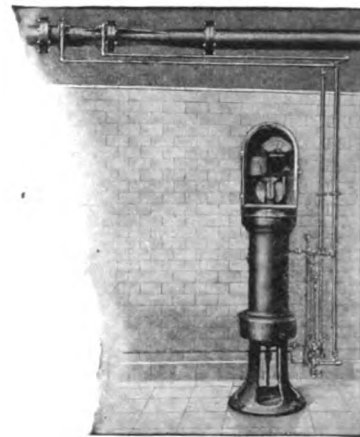
The Simplex Venturi tube meter is a highly important factor in the economical and efficient operation of water works pumping stations, gravity works and industrial plants.

The Simplex portable recorder is particularly useful when Venturi tubes are already installed in the pipe lines, but where stationary meters have not been supplied. It is equally applicable for use with Pitot tubes.

Simplex Boiler Feed Meter

The Simplex boiler feed meter indicates, records, and totalizes the flow in pounds per hour above and below 200° Fahr.

The only part of the Simplex meter through which feed water flows is a Venturi tube placed in the feed line. There are no mechanisms or projections within this tube. There are no parts to become warped by high temperature or to become clogged and scored by sediment.

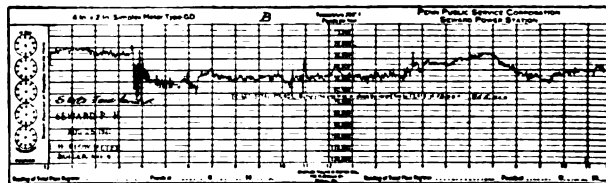


SIMPLEX BOILER FEED METER

Simplex Boiler Feed Meter Recording Chart

The Simplex boiler feed meter chart shows the periods of high and low power demand, records the rating at which the boiler operates, records the time and duration of boiler blowdowns and reveals the sensitiveness of automatic feed controllers and the results of regulating the boiler feed by hand.

The distinctive features of the Simplex meter chart are: the chart has equal spaces for pen movement at all rates of flow, the entire boiler performance record shown on the chart is conveniently read and analyzed without the necessity of rotating the chart, and the area of the chart record is a direct function of the total flow and is determined readily and quickly with an ordinary planimeter. No special planimeter is required. A facsimile of the face of the totalizing dial is printed on each chart. Thus the meter reader can for future reference sketch the positions of the totalizing pointers on the chart at the time of its removal.



A TYPICAL SIMPLEX METER CHART

THE MOTO-METER COMPANY, INC.

Manufacturers of Boyce Moto-Meter Industrial Thermometers

LONG ISLAND CITY, N. Y.

Product

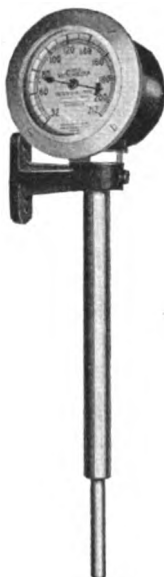
A standardized MECHANICAL TYPE THERMOMETER for industrial purposes.

Movement

The same movement is used in the industrial type Boyce Moto-Meter as was developed in connection with the United States Bureau of Standards to meet the severe requirements of the Army and Navy Air Service. An instrument of precision in which hair springs, gears, levers and other delicate mechanical movements have been entirely eliminated. Yet, through standardized quantity production, this instrument can be obtained at prices almost competitive with the high grade glass thermometer.

One Model

All industrial thermometers are manufactured with 3-in. dial, but can be obtained with either direct or distance readings up to 30 ft. of capillary and in various ranges.



INDUSTRIAL
TYPE BOYCE
MOTO-METER

Range

The industrial type Boyce Moto-Meter indicates accurately temperatures from minus 40° Fahr. to plus 500° Fahr. (-40° C. to +300° C.) Various scales between these limits are kept in stock.

Construction

A hollow spiral Bourdon coil 33 in. long supplies the entire range movement without recourse to gears or levers.

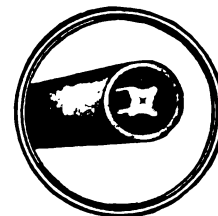


CROSS SECTION
SHOWING BOUR-
DON COIL

Capillaries

The patented Schlaich star shaped capillary tubing, as shown in the illustration, is used throughout. This tubing is rolled in such a way as to reduce the bore to one-third its normal minimum, yet the tubing is stronger and the passage is absolutely free. This is another exclusive feature which decreases the necessity of compensation in the head, so that a simple coil of bi-metal only is required for this purpose.

This instrument is absolutely free from altitude error and fully compensated.



ENLARGED CROSS
SECTION SHOWING
SCHLAICH STAR
SHAPED CAPILLARY
TUBING

Uses

At the present time industrial type Boyce Moto-Meters are in use on the main shaft bearings of United States Navy submarines, in the powder magazines of United States battleships, on fruit refrigerators of the largest fruit shippers, and developing tanks of motion picture producers. Also in candy factories, chemical and dye plants and in many other large industries.

The industrial type Boyce Moto-Meter is now in use throughout the entire country to indicate the temperature in ovens and drying rooms, enabling the manufacturers to maintain the proper temperature. In coal piles they give warning of dangerous temperatures and on kettles and pasteurizers they are preventing waste through inaccurate knowledge of temperature. In a number of plants manufacturers are replacing the frail glass stemmed instruments, which are easily broken, with the industrial type Boyce Moto-Meters which are absolutely unbreakable.

Engineering Service

Our Engineering Department will gladly consult with you on any problem requiring a knowledge of accurate temperature and advise of the cost of the instrument best adapted for your use.

If you have any heat indicating problem, drop us a line.

AMERICAN STEAM GAUGE & VALVE MFG. CO.

ESTABLISHED 1851

MAIN OFFICE AND WORKS

BOSTON, MASS.

BRANCH OFFICES

NEW YORK, N. Y.

CHICAGO, ILL.

PITTSBURGH, PA.

ATLANTA, GA.

LOS ANGELES, CAL.

Products

Manufacturers of GAUGES: both Indicating and Recording, for steam, water, air, oil, gas, hydraulic, ammonia and all other pressures; also Vacuum and Compound; RECORDING THERMOMETERS; POP SAFETY and RELIEF VALVES; ENGINE INDICATORS; STEAM TRAPS; FEED WATER GREASE EXTRACTORS.

Also, manufacturers of Gauge Testers, Engine Room Clocks, Revolution Counters, Steam Whistles, Hydraulographs, Trainographs and Gauge Boards.

American Gauges

All parts subject to wear are of rugged construction and made of specially hard, wear-defying metal. Segment and pinion have unusually wide face to reduce wear. Every dial is *individually hand calibrated*, insuring absolute accuracy.

Catalogue No. 70 on request.

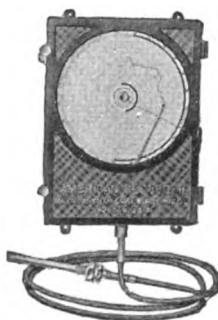


INDICATING GAUGE

American Recording Gauges and Thermometers

Recording Gauges for all pressures or vacuum, made in round cases, sizes 6 $\frac{3}{4}$, 8 $\frac{1}{2}$, 10 and 12 in.

Temperature Recorders for all temperatures from minus 40° to 1000° Fahr.; made in square moistureproof case, as illustrated, for 10-in. chart. All American recorders are equipped with high grade clock movements, glass fountain pens, balanced, adjustable pen arms, automatic pen lifters and non-removable chart holders. Write for special booklet.



RECORDING THERMOMETER

American Pop Safety Valve

Is very simple in construction and has fewer working parts than other valves. All adjustments can be made from outside without taking valve apart. Bushings never leak. Every valve is guaranteed to open promptly at pressure stamped thereon and to close just as promptly with minimum loss of steam.

Every valve is tested at factory under actual working steam pressure. Send for Catalogue No. 70.



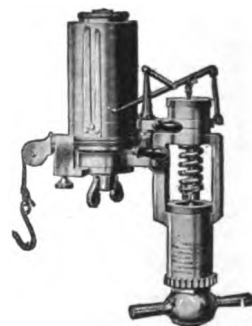
POP SAFETY VALVE

American-Thompson Improved Engine Indicator

This is the original Thompson Indicator and has features found in no other make. The detent motion makes it possible to take as many cards as desired with-

out unhooking cord, and cord will remain at same tension. Cards can be made in less time than is possible without the exclusive American detent motion. In addition, these cards are by far the most accurate, due to the short arm and limited movement of pencil.

Exposed spring is free from temperature changes and can be changed with utmost facility. Send for American-Thompson Indicator Catalogue.

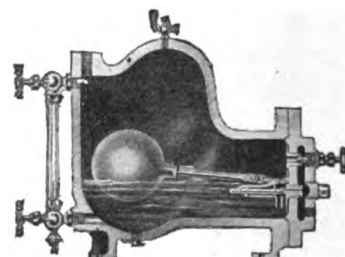


AMERICAN-THOMPSON IMPROVED INDICATOR

American Ideal Steam Trap

Built on extremely rugged lines and guaranteed for all pressures. Valve discharge orifice is much larger than in ordinary traps, which means larger capacity. Consequently a smaller trap can be used. It also enables dirt and scale to pass off and prevents clogging. Valve seat can be renewed without making disconnections. The heavy Hercules float is made of seamless, non-corroding copper. It resists pressures up to 600 lbs. per sq. in. and is guaranteed for life of trap. Valve seats are under continuous water seal, thus can not leak live steam.

Send for booklet "A Steam Trap Catechism."



AMERICAN IDEAL TRAP

American H₂O Grease Extracting Feed Water Filter

With this device, oil can not get into the boiler, thus preventing dangerous bagging of plates and oil-caked tubes. Keeps heating surfaces clean, increases steaming capacity and lowers coal bills. Filtering surface is many times the area of feed water pipes. Has device for applying a reverse steam current for temporary cleaning. Renewals are easy to make. Every part easily cleaned. Minimum maintenance cost.

American Standard Water Relief Valve

Has iron body and bronze mounting, with high grade steel springs. Intended for use on pumps, tanks, pipe lines, etc., where requirements are not as severe as in fire protection service, for which service we recommend our Underwriter type valve. These valves have unusually large relieving capacity, and both connections can be furnished threaded or flanged at slight additional cost. Regularly furnished set at any desired pressure not exceeding 250 lbs. Send for Catalogue No. 70.



STANDARD WATER RELIEF VALVE

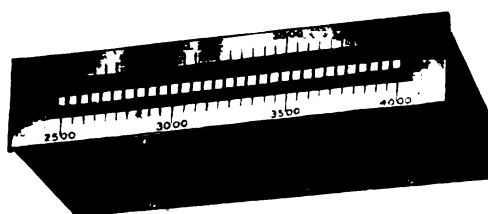
JAMES G. BIDDLE

Industrial and Scientific Instruments

1211-1213 Arch Street
PHILADELPHIA, PA.

Products

"MEGGER" TESTING SETS and BRIDGE MEGGERS; "JAGABI" HAND TACHOMETERS and HAND TACHOSCOPES; "FRAHM" VIBRATING-REED TACHOMETERS and FREQUENCY INDICATORS; "JAGABI" SLIDING-CONTACT VARIABLE RHEOSTATS.



"FRAHM" VIBRATING-REED HAND TACHOMETER
Bulletin 960

By merely holding in contact with machine under test, proper reed will vibrate. Made with one or two rows of reeds



"MEGGER" TESTING SET
Catalogue 940

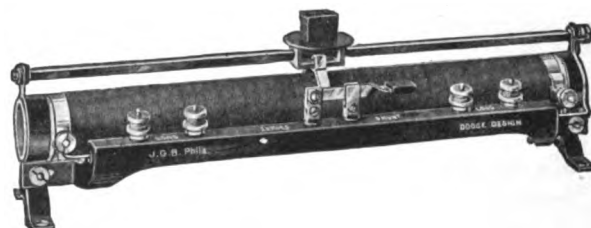
For measuring insulation or conductor resistance directly in megohms or ohms. Portable, self-contained, rugged

Scope of Adaptability

Biddle industrial and scientific instruments provide accurate means of securing technical information to aid in the efficient maintenance of all kinds of electrical equipment. These include:

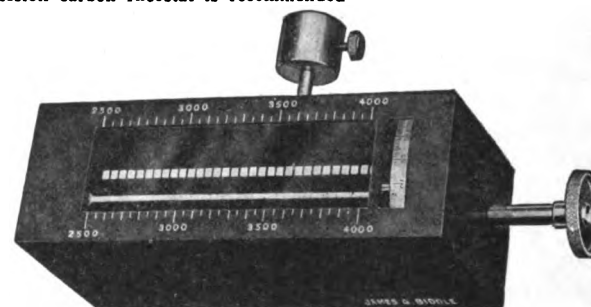
(1) Instruments for testing insulation resistance of generators, motors, transformers, switchboards, insulators, cables, feeders, interior wiring, etc.

(2) Frequency and speed indicating instruments for all purposes, especially for permanent mounting on steam turbines and other relatively high speed movers, and for service where portable meters are required.



"JAGABI" SLIDING CONTACT VARIABLE RHEOSTAT
Bulletin 980

Capacities up to 25 amperes. For regulating larger currents, compression carbon rheostat is recommended



"JAGABI" VIBROMETER
Bulletin 915

Tuned reeds with gauge to indicate amplitude of their vibration and provide means for comparison with vibration of machine



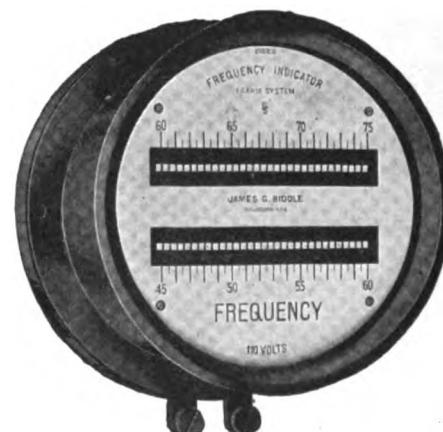
"FRAHM" VIBRATING-REED TACHOMETER
Bulletin 955

For stationary mounting directly on machine. Indicates by means of a series of vibrating reeds tuned to respond to vibrations as received from machine. No gears, no belt, no electrical connections



"JAGABI" MULTIRANGE
HAND TACHOMETER,
TYPE C
Bulletin 975

Operates on centrifugal principle. Indicator follows every variation as soon as point is applied to end of rotating shaft, showing revolutions per minute on dial



"FRAHM" VIBRATING-REED FREQUENCY
INDICATOR
Bulletin 950

Reeds are actuated by an alternating current magnet which is excited from circuit, frequency of which is to be measured. Also made in portable type

THE BRISTOL COMPANY

Recording Instruments
WATERBURY, CONN.

BRANCH OFFICES

BOSTON, MASS., Old South Building
PITTSBURGH, PA., Frick Building
CHICAGO, ILL., Monadnock Building

SAN FRANCISCO, CAL., Rialto Building

NEW YORK, N. Y., 114 Liberty Street
DETROIT, MICH., Book Building
ST. LOUIS, MO., Boatmen's Bank Building

Products

BRISTOL'S RECORDING PRESSURE and VACUUM GAUGES; LIQUID LEVEL GAUGES; LONG DISTANCE TRANSMITTING and RECORDING SYSTEM; RECORDING THERMOMETERS; RECORDING PSYCHROMETERS; INDICATING and RECORDING ELECTRIC PYROMETERS; THERMOSTATS; TEMPERATURE CONTROLLERS; RECORDING VOLTMETERS, AMMETERS, and WATTMETERS; RECORDING MILLIVOLTMETERS; ELECTRICAL and MECHANICAL TIME RECORDERS; RECORDING TACHOMETERS.

Also manufacturers of Recording Draft and Combination Gauges, Recording Shunt Ammeters, Frequency Meters, Engine Counters, Revolution Counters, Bristol-Durand Radii Averaging Instruments.

For Belt Lacing, Safety Setscrews, etc., see page 722.

Bristol's Recording Pressure and Vacuum Gauges

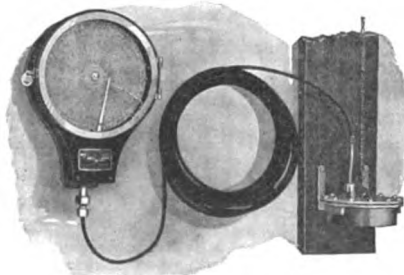
For securing continuous night and day records of pressure or vacuum, for steam, air, gas and liquids. Charts furnished to read in pounds, ounces, inches, feet, metric or any desired units; for ranges from full vacuum to 12,000 lbs. per sq. in.

The construction of these instruments is extremely simple. On instruments for high ranges, the pen-arms are attached directly to the pressure tubes without employing gears, levers or other multiplying devices. The original form Model 11 case affords space for a long length of pen-arm with small angle of deflection to cover entire scale. Many instruments of this model have been in continuous service for 15 years without even being repaired.

Round form models can be furnished at somewhat lower prices than the original form.

Bristol's Recording Liquid Level Gauges

For use where it is necessary or desirable to locate recording instruments at a higher or a lower level than the liquid to be measured. Especially valuable for automatically and continuously recording the depth or level of water or other liquids in tanks, water towers, reservoirs, etc. Differing from float gauges, these instruments are independent of freezing temperatures.

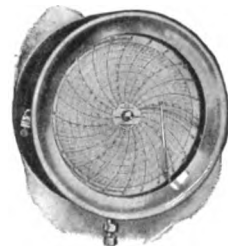


RECORDING LIQUID LEVEL GAUGE

TRADE-MARK
BRISTOL'S
REG. U. S. PAT. OFFICE



RECORDING GAUGE
Original form—Model 11



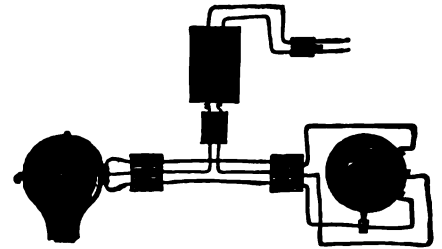
RECORDING GAUGE
Round form—Model 60

Bristol's Long Distance Transmitting and Recording System

For transmitting electrically, over distances of many miles, records of pressure,

liquid level, temperature, mechanical motions, etc.

The needs for such an equipment are numerous in connection with water works, central heating stations, hydro-electric plants, gas distribution systems, irrigation projects, etc.



LONG DISTANCE PRESSURE GAUGE

Bristol's Recording Thermometers

For all commercial ranges of temperatures from 60° below zero to 800° Fahr.

Equipment furnished with plain sensitive bulb for use in dry kilns, etc. The bulb is located where the temperature is to be measured, and connected with flexible leads to the recorder, which may be placed in the most convenient location. Patented automatic compensators furnished when needed to insure accurate results.



RECORDING THERMOMETER
Model 311

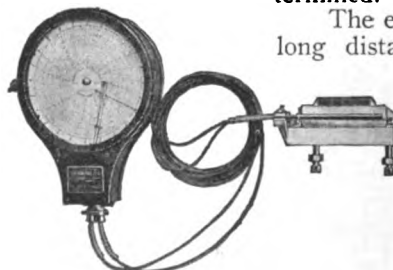


RECORDING THERMOMETER
Moistureproof—Model 140

Also furnished with bulbs having union and screw connections for recording temperatures of water or other liquids in closed spaces under pressure, such as boiler feed water, superheated steam, milk pasteurizers, etc.

Bristol's Recording Wet and Dry Bulb Thermometers or Psychrometers

An accurate and dependable instrument by which relative humidity or atmospheric moisture may be determined.



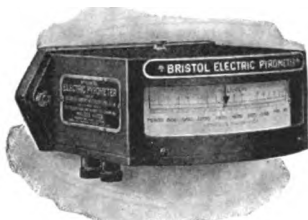
RECORDING PSYCHROMETER

The equipment shown is the long distance type which permits the sensitive bulb to be installed at a considerable distance from the instrument. The water reservoir is of the continuous flow type, an exclusive Bristol's feature.

Bristol's Indicating and Recording Electric Pyrometers

For ranges up to 3000° Fahr. The internal type cold end compensator exclusively applied to Bristol's pyrometers is one of the most radical improvements in thermo-electric pyrometry.

High resistance Model 319 is especially suited for use in connection with furnaces for hardening high speed steel, also brick and pottery kilns and furnaces. Pyrometer may be installed a long distance from the furnace if desired. Portable



INDICATING PYROMETER
High resistance Model 319



RECORDING VOLT-METER
Switchboard—Model 510

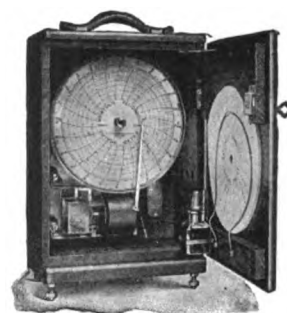
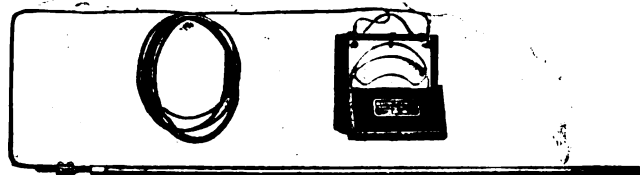


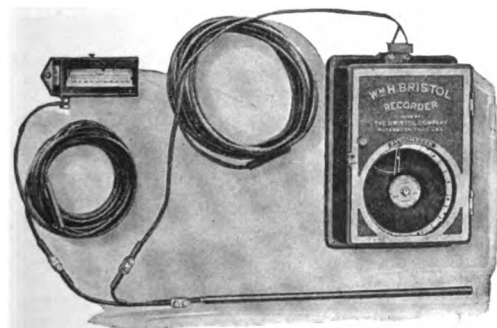
FIG. 573. RECORDING AMMETER
Portable—Model 612



PORTABLE INDICATING PYROMETER

instruments can be furnished, suitable for general checking both in shop and laboratory.

Combination units of Bristol's pyrometers are ex-

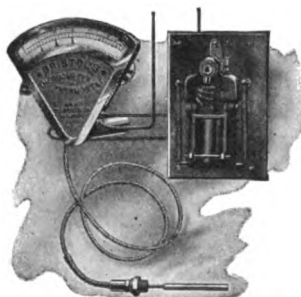


COMBINATION UNIT OF ELECTRIC PYROMETERS

tensively used, indicating instrument being located at the furnace to guide the operator, and recording instrument located in superintendent's office.

Bristol's Temperature Controllers

For automatically controlling temperatures of ovens and furnaces heated by oil, gas or electricity. Models 176, 276 and 376 are used for temperatures up to 800° Fahr.; Model 473 for higher temperatures.



THERMOSTAT
Model 276



TEMPERATURE
CONTROLLER
Model 473 for high
temperatures

Bristol's Recording Electric Meters

Bristol's recording voltmeters for all commercial ranges of direct and alternating current. It is important to maintain uniform voltage for operating electric lights and for many other purposes. Records obtained with Bristol voltmeters show whether desired results are secured.

Bristol's recording ammeters, furnished in switchboard for portable type, provide continuous records of current on generator and feeder panels, for motor and transformer tests and to provide records of customers' current consumption.

Bristol's strip type recording wattmeter, portable model, designed for use on both polyphase and single phase alternating current. Convenient and practical for carrying about to points where it is desired to obtain records of consumption of electrical energy.

Bristol's recording millivoltmeters, equipped with high grade pivot jewel bearing movements, are extensively used for recording very minute potentials which are involved in electrolysis investigations.



RECORDING MILLI-VOLTMETER
Portable type

RECORDING WATTMETER
Strip type—Model 725

Bristol's Operation Recorders

For recording occurrence and duration of mechanical movements and machine operations.

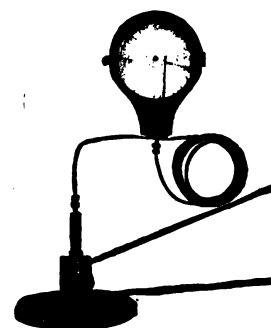
This strip type electric time recorder is designed to record 20 different operations on one chart. There are thousands of uses for this operation recorder in manufacturing plants. Easy to install.



ELECTRIC TIME RECORDER
Strip type—Model 925

Bristol's Recording Tachometers

For recording speed of shafting, machines, engines, etc. Furnished in pneumatic type or electric for either alternating or direct current. Simple in construction. Particularly suitable for use with paper machines and for use in connection with blowing engines at blast furnace plants.



RECORDING TACHOMETER

THE BROWN INSTRUMENT COMPANY

Pyrometers, Thermometers and Recording Instruments

PHILADELPHIA, PA.

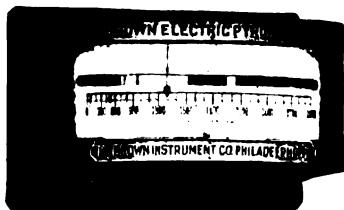
NEW YORK, 50 Church Street
DENVER, 1742 Champa Street
SAN FRANCISCO, 576 Mission Street

BRANCH OFFICES
PITTSBURGH, Oliver Building
CHICAGO, Conway Building
DETROIT, Ford Building

ST. LOUIS, Railway Exchange Building
LOS ANGELES, 363 New High Street
MONTREAL, CANADA, 414 St. James Street

Products

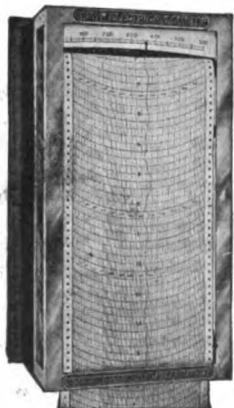
PYROMETERS; THERMOMETERS; GAUGES; TACHOMETERS and other SCIENTIFIC INSTRUMENTS.



HIGH RESISTANCE INDICATING PYROMETER



RECORDING PYROMETER



CONTINUOUS RECORDING PYROMETER



PORTABLE PYROMETER

High Resistance Indicating Pyrometer

For measuring temperatures from 300° to 3000° Fahr. or equivalent centigrade. Operates on thermo-electric principle. Entirely unaffected by temperature changes along wire connecting thermo-couple to instrument. Also designed to automatically control or regulate temperatures of electric, gas or oil furnaces.

High Resistance Recording Pyrometer

Keeps a continuous record, day and night, of temperatures. Eliminates guesswork. Gives executive a check on plant operation.

Continuous Recording Pyrometer

Makes a continuous record of temperatures over a two months' period. It requires only the winding of an 8-day clock mechanism once a week. Made in types to record the temperature of 1, 2, 4, 6, 8 or 10 thermo-couples in different colors on one chart.

Portable Pyrometer

Made in both high and low resistance types. Height, 7 in.; width, 7 in.; depth, 4½ in.; weight, only 6½ lbs.

Recording Thermometers

For measuring temperatures up to 800° Fahr. Operates on the principle of expansion of gas or liquid with change of temperature. Tubing can be 100 ft. long.

Readings are unaffected by atmospheric changes in temperature along tubing or at instrument. Makes a clear, accurate chart.

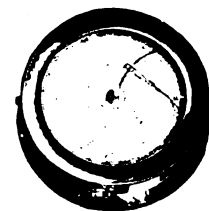


RECORDING THERMOMETER

Recording Pressure Gauge

For recording all ranges of vacuum and pressure from a few ounces of water to 3000 lbs.

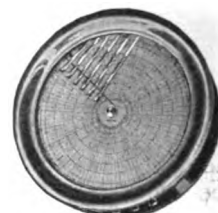
Operate through expansion or contraction of a helical hollow spring for high pressure and a series of diaphragms for lower pressures and vacuums. Positive and accurate.



RECORDING PRESSURE GAUGE

Time and Operation Recorder

Extensively used for recording the time of operation of machinery, switches, valves, pumps; for recording the reversals of glass melting tanks, open hearth furnaces and annealing furnaces. Also for recording the time of starting and stopping of paper machines and other devices.



TIME AND OPERATION RECORDER

Other Brown Instruments

Ammeters; draft gauges; electrical tachometers; mercurial tachometers; mercury gauges; milli-ammeters; milli-voltmeters; recording gauges; temperature controllers; mercurial thermometers; vacuum gauges; voltmeters; differential gauges.



BROWN ELECTRIC TACHOMETER



BROWN DRAFT GAUGE



BROWN MERCURIAL THERMOMETER, INDUSTRIAL TYPE

THE JOS. W. HAYS CORPORATION

Manufacturers of Combustion Instruments

1044 East Eighth Street
MICHIGAN CITY, IND.

Products

HAYS AUTOMATIC CO₂ and DRAFT RECORDER;
HAYS DRAFT GAGES; HAYS IMPROVED GAS ANALYZER.

Hays Automatic CO₂ and Draft Recorder

Hays Automatic CO₂ and Draft Recorder tells the complete story about how fuel is burned. "What," "when" and "why" are all recorded in picture form before the eyes of the men responsible for efficiency. Several thousand are paying for themselves over and over in plants burning coal, powdered coal, oil, gas, sawdust and other waste materials. Some of the features are:



HAYS AUTOMATIC CO₂ AND
DRAFT RECORDER

Awarded certificate of merit by
Franklin Institute

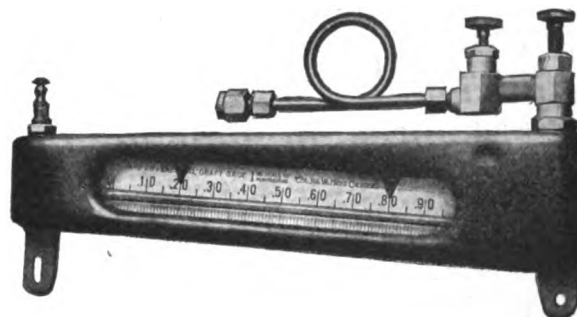
Small lag; accurate to 5/10 of 1%; no wearing surface; operated by columns of water, mercury and gas; gas drawn from boiler continuously; machine trapping off fresh samples periodically; self-adjusting mercury valve keeps water at proper level; machine automatically controls pressure and temperature of gas; rapid and complete absorption (steel wool method); analysis every 2½ minutes; visible operation — strong moulded glass like gage glass used in important places, with packing nut connections; draft record on same chart with CO₂ adds "why" to "what"; low efficiency alarm rings bell, or lights light to

warn firemen, engineers, superintendent, etc., when efficiency is low; automatic pen lifter releases pens from chart when desired, making it impossible to spoil chart; low cost of maintenance and operation.

Interesting literature and reproductions of actual charts sent on request.

Hays Draft Gages

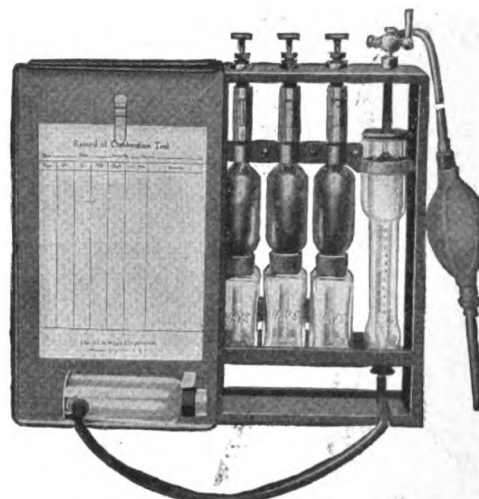
Draft gages of all styles and ranges for all purposes, finished in nickel, aluminum or black enamel (baked). The illustration shows the Hays 1-in. black enamel Differential Draft Gage for boiler furnace. It never tarnishes; the scale is easy to read; there is a micrometer oil leveling attachment to bring the oil to zero without tediously using a dropper to add or remove a drop until the proper level is attained. Designed by practical engineers, Hays Draft Gages are the compass by which the fireman steers the furnace. Write for a 24-page treatise on "Drafts and Draft Regulation" by Jos. W. Hays, Combustion Engineer. It is free.



HAYS DRAFT GAGE

Hays Improved Gas Analyzer

The Hays Improved Gas Analyzer (16 models for various purposes) represents the highest development in hand analyzers. No troublesome pinch clamps on rubber connections, no frail glass cocks to stick and break, but



HAYS IMPROVED GAS ANALYZER

special metal needle valves with renewable seats instead. Operation is visible, but practically all of the glass parts are the heavy moulded variety, like gage glass, held with packing nut connections instead of rubber tubing. No glass comes in contact with metal. The Hays patented steel wool method of absorption is the most rapid and satisfactory one known. (CO₂ analysis in 30 seconds, complete analysis in 3½ minutes.) Compact, rugged, convenient, practical. Size of analyzer for CO₂, O₂ and CO 14½x8x3¼ in. Neat leather carrying cases for consulting or service engineers. Special analyzers for carbonic companies, chemical plants, lime kilns, cement plants, fruit or refrigerating companies, etc.

Literature on request.

Literature

Publishers of "How to Build up Furnace Efficiency," the well-known "Fireman's Bible" by Jos. W. Hays. Sixteenth edition just off the press, \$1.00 per copy postpaid.

THE FOXBORO CO., INC.

Manufacturers of Recording and Indicating Instruments

FOXBORO, MASS.

BRANCH OFFICES

NEW YORK, N. Y., 50 Church Street
CHICAGO, ILL., Monadnock Building
PITTSBURGH, PA., Park Building
PHILADELPHIA, PA., Stock Exchange Building

BIRMINGHAM, ALA., Brown-Marx Building
SAN FRANCISCO, CAL., 461 Market Street
TULSA, OKLA., 213 South Cincinnati Avenue
MONTREAL, QUE., PEACOCK BROS.

Products

FOXBORO RECORDING and INDICATING GAUGES for pressure and vacuum; RECORDING and INDICATING THERMOMETERS; RECORDING PSYCHROMETERS; AUTOMATIC TEMPERATURE RECORDER-CONTROLLERS; INDICATING and RECORDING LIQUID LEVEL GAUGES; DIFFERENTIAL PRESSURE RECORDERS; FLOW METERS for gas and liquids; RADIAL PLANIMETERS; REVOLUTION COUNTERS; CO₂ RECORDERS for flue gas analysis; GAUGE BOARDS.

Also manufacturers of Indicating and Recording Electric Pyrometers; Mechanical and Electric Time Recorders; Clocks; Indicating and Recording Tachometers; Siphon and Mercury Gauges; Air-speed Indicators; Airplane Thermometers.



RECORDING GAUGE
Sizes 8, 10 and 12 in. Any finish desired



INDICATING GAUGE
Sizes 2 to 24 in. Range, from full vacuum to 20,000 lbs. per sq. in.



RECORDING THERMOMETER
Sizes 8, 10 and 12 in. From —60° to +1000° Fahr., or corresponding ranges in Centigrade or Reaumur

Foxboro Gauges

Recording—For steam, gas, water, air, oil, ammonia, brine, anything under vacuum or pressure; any range from full vacuum up to 20,000 lbs.; any unit of measurement: inches, water, ounces, pounds, feet, metric units, etc.

New inverted type does away with blotted records and dirty pen arms. All gauges are equipped with patented chart holder; micrometer adjustment pen arm; automatic release pen lifter. All cases round form and dusttight.

Also 2-pen recording gauges furnished to record 2 separate pressures on one chart. Bulletin BA-98-1.

Indicating—All movements are absolutely non-corrosive and independent of the case. Perfect alignment of working parts insures accuracy.

Ammonia gauges and hydraulic gauges for pressures over 1000 lbs. have nickel steel screwed tubes. Positively will not set or leak.

Bulletin BA-95-1.

Foxboro Thermometers

Recording—Depend upon expansion of liquids, gas and the vapor tension of



volatile liquids for their action. Impossible to deteriorate with age.

No mercury used—effect of atmospheric conditions is thus eliminated.

Connecting tube can be 300 ft. long and accurate results guaranteed.

The actuating movement is our improved helical tube movement. *No multiplying devices are used.*

Charts either even scale or increasing scale as desired.

Bulbs made to suit any kind of application. Special lead and acid resisting bulbs are made for the chemical industry.

Also 2-pen and 3-pen recording thermometers, to record on one chart 2 or 3 separate temperatures, can be supplied.

Bulletin No. BA-104-1.

Indicating—Designed to eliminate excessive breakage.

An instrument easy to read and of the long distance type as well as stem type.

No mercury—the same principle applies as in the recording thermometer.

Bulletin BA-104-1.

Foxboro Recording Psychrometers

The principle is the same as in the recording thermometers, but there are 2 pens: one to record the dry bulb, and the other the wet bulb temperatures.

Furnished in 2 distinct types: self-contained, and long-distance as illustrated.

Applied successfully in many industries where drying is done, and where excess humidity is detrimental to production.

A special table furnished with each instrument makes determination of humidity very easy.

Bulletin BA-103-1.



INDICATING THERMOMETER
From —25° to +1000° Fahr., or corresponding degrees Centigrade or Reaumur



RECORDING PSYCHROMETER

Foxboro Automatic Temperature Recorder-Controller

A new design in which the functions of two instruments have been combined and so co-ordinated that perfect synchronization is obtained. *The use of only one bulb to actuate both the recorder and the controller elements gives an accurate record of the controller operation.*



**AUTOMATIC TEMPERATURE
RECORDER-CONTROLLER**

Will operate valves from 1/4 to 12 in. and on temperatures from -25° to +1000° Fahr. Set lever with cross arm at required temperature, and this temperature will be maintained automatically until setting is changed.



LIQUID LEVEL GAUGE



**DIFFERENTIAL
RECORDING GAUGE**

Guaranteed to give satisfactory results under pressures from 0 to 4-in. head of water and up to any desired differential pressure, and under static pressure up to 1000 lbs. per sq. in.

Valves designed to operate on either pressure or vacuum.

An improved form of rubber diaphragm motor is employed, which is so designed that, even under severe conditions, no undue stresses are set up in the diaphragm itself.

Bulletin BA-127 is all about this new instrument.

Foxboro Liquid Level Gauges

Both indicating and recording types.

Primarily designed for recording varying levels of rivers, reservoirs, canals, forebays, tail races, etc.; but have been widely adopted for sewer work, weir measurements and specify gravity recorders. Paper mills use them to record the height of stuff in Jordan stuff chests, etc.

They are not affected by ice formation; can be used on liquids other than water; guaranteed for accuracy and will be sent on trial.

Complete list in Bulletin No. BA-82-1.

Foxboro Differential Pressure Recorders and Orifice Meters for Gas

The difference between two existing pressures can be accurately recorded by these instruments. Float type. Can not blow mercury.

Used extensively in connection with orifice plates, Pitot tubes and Venturi throats for measuring the flow of gases and liquids under pressure.

Complete orifice meters for measuring the flow of gases and liquids are supplied. A complete meter consists of a differential recorder, static pressure recording gauge, special flange union and orifice plate as shown. The

instruments are mounted on angle iron frame, with all necessary pipe fittings.

These meters are adaptable to many kinds of service.

Complete data in Bulletin No. BA-113.



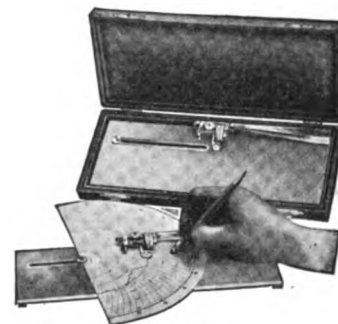
ORIFICE PLATE AND FLANGES

Foxboro Improved Radial Planimeters

For averaging any kind of records on circular charts. A very convenient instrument. Gives mean ordinate in linear inches.

Made for us by Amsler & Son, Switzerland.

Complete information and instructions for use will be found in Bulletin BA-101.



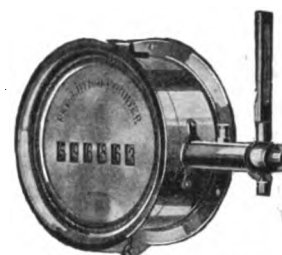
RADIAL PLANIMETER

Foxboro Revolution Counters

For either right or left, rotary or reciprocating motions. Equipped with easily operated device for resetting to zero.

Can be built with capacity of 99,999,999. Round type furnished in sizes, 6, 8 1/2, 10 and 12 in.

Send for Bulletin BA-95.



**REVOLUTION COUNTER
Round type**

Foxboro CO₂ Recorder

Used for flue-gas analysis. Compact and rugged in construction. Simple, sure and accurate in operation. No rubber tubing to deteriorate. This is strictly a commercial machine and not a delicate laboratory instrument.

A neat dotted line on the chart shows amount of CO₂ in flue gas at a glance, affording ready means for observing the efficiency of firing.

The recorder can be furnished with a Foxboro diaphragm type draft movement. Write for particulars.

Send for Bulletin BA-114.



CO₂ RECORDER

Foxboro Gauge Boards

This company is prepared to design and build to order neat attractive gauge boards for any combination of Foxboro instruments.

Complete proposals will be submitted on receipt of specifications.

How to Specify

Specify Foxboro recording and indicating instruments. Our Engineering Department is at your service.

PRECISION INSTRUMENT COMPANY

Recording and Indicating Instruments for Power and Gas Plants

FACTORY AND MAIN OFFICE

21 Halsey Street
NEWARK, N. J.

BRANCH OFFICE, DETROIT, MICH.

Products

INDICATING and RECORDING DIRECT READING or DIFFERENTIAL GAUGES for Vacuum and Pressure, with scales in inches, pounds and millimeters of water, mercury and kerosene; DIFFERENTIAL DRAFT GAUGES; AUTOMATIC CO₂ RECORDERS, SO₂ RECORDERS; HAND ORSATS or FLUE GAS ANALYZERS; COAL and OIL CALORIMETERS; HYDROSTATIC GAUGES; MICROMETER LEVEL GAUGES; RECORDING GAS CALORIGRAPHS; SPECIFIC GRAVITY RECORDERS; LABORATORY TEST METERS.

Also manufacturers of Gas Collectors; Pitot Tubes; Venturi Tubes; Chemical Glassware.

Patents and Copyrights

Our gauges and other apparatus are patented and sold under copyright.

Indicating and Recording Gauges

Precision 2-in-1 Draft Gauges—For use in natural draft boilers, showing the draft in the combustion chamber and the last pass or any other points of draft desired. Furnished in indicating or 24-hour recording types, in any range to meet requirements.



PRECISION 2-IN-1 INDICATING GAUGE

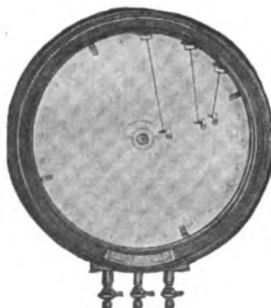


PRECISION 2-IN-1 RECORDING GAUGE

Precision 3-in-1 Draft Gauges—For use with stokers with forced draft and are installed to enable the



PRECISION 3-IN-1 INDICATING GAUGE



PRECISION 3-IN-1 RECORDING GAUGE



PRECISION 24-HOUR RECORDING GAUGE



PRECISION SINGLE GAUGE

operating man to see at a glance the three vital points of draft in a boiler. Furnished in indicating or 24-hour recording types.

Precision 4-in-1 Draft Gauges

For use in installations where an economizer is installed or with stokers having 2 compartments below the grates. All ranges to meet requirements.



PRECISION 4-IN-1 INDICATING GAUGE

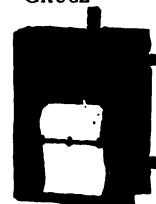
Precision 5-in-1 Draft Gauges

For indicating the drafts in boilers where Cox or Harrington stokers are installed, enabling the fireman to read pressure and drafts at every part of the boiler. Dead beat construction under Precision patents.



PRECISION 5-IN-1 INDICATING GAUGE

Precision 60-day Tape Draft Gauges—Supplied in ranges from 2-in. vacuum to any desired pressure. Dead beat construction. Used to record drafts at the boiler or steam pressure.



PRECISION 60-DAY TAPE GAUGE

Pressure and Vacuum Gauges

Precision Single Indicating Gauges—For indicating vacuums or pressures. Rugged in construction and of the well-known Precision dead beat type.

Supplied in inches, pounds and millimeters of water, mercury or kerosene.

Precision 24-hour Recording Gauges—Guaranteed accurate. Dead beat construction. Ranges, 1 in. to 500 lbs. vacuum and pressure. In feet head for liquid levels. For coke oven use, can be supplied in millimeters of kerosene.

Combined Indicating and Recording Gauges

Give the indication at a glance, also the permanent record of the condition on a 60-day tape chart. Made for either vacuum or pressure, direct reading or differential. Supplied with rewinding device for used chart, if desired. Case is of all-metal construction, black enamel. Bronze front furnished at extra cost.



COMBINED INDICATING AND RECORDING GAUGE

CO₂ Recorders

Automatically analyze flue gases and record on a 24-hour or 60-day chart. True orsat in principle. Reagent used is potassium hydroxide.

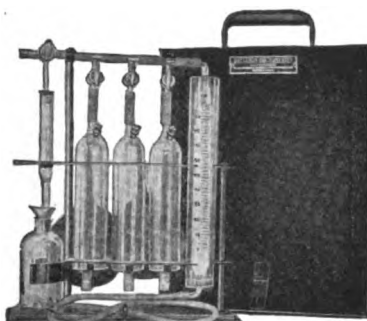
Simple in construction; accurate to .5 of 1% CO₂. Standard range, 0 to 20% CO₂. Also supplied in 0 to 10% for producer gas; 0 to 50% for blast furnaces and lime and cement kilns; 65% to 100% for soda ash manufacturers.

CO₂ RECORDER**SO₂ Recorders**

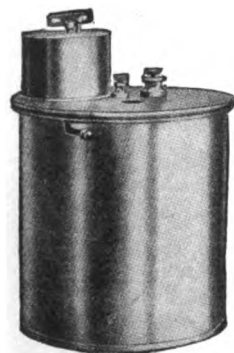
Of the same general principle as CO₂ recorders, but adapted to analyze sulphur dioxide.

Standard Orsats

Orsats in 1, 2, 3 and 4 tubes. Burettes graduated for 50 cc or 100 cc. All metal and glass construction. Analyze for CO₂, CO, O and H. Orsats for other readings can be supplied to specifications.



PRECISION 100 CC STANDARD ORSAT



PRECISION COAL CALORIMETER

Coal and Oil Calorimeters

This company has been identified with the manufacture and sale of coal calorimeters for a number of years, and has developed simple and reliable patented instruments for determining the heating value of coal or oil.

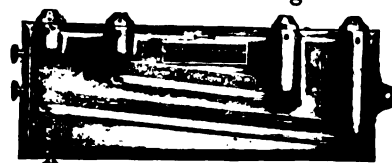
These instruments afford coal buyers the financial advantage of buying coal on a heating value basis from tests of coal offered for sale.

Precision Hydrostatic Gauges

For open hearth furnaces, coke ovens, or gas plants, Precision hydrostatic gauges can be supplied. They are guaranteed accurate and reliable. Data on request.

Micrometer Level Gauges (Single and Double)

Combine rapid and accurate calibration with low maintenance and minimum chance of breakage. Absolutely no strain is placed on the glass. Connection between glass and metal is through a simple seal.



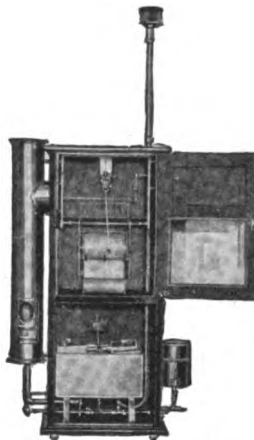
PRECISION DOUBLE MICROMETER LEVEL GAUGE

Recording Gas Calorographs

For recording on a 60-day chart the British thermal units of artificial, natural or producer gas. Automatically compensate for variations in temperature, specific gravity and pressure.

Accurate and reliable. Simple in construction and give permanent record.

Can also be supplied calibrated in calories. Patents pending.



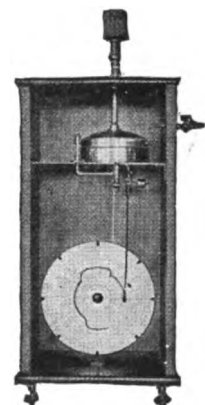
PRECISION RECORDING CALOROGRAPH

Specific Gravity Recorders

These instruments automatically record specific gravity of gases and are applicable for natural gas, producer gas, artificial gas and in the oil and gasoline fields.

They are accurate, simple and reliable.

24-hour disc and tape types and 7-day disc types.



PRECISION SPECIFIC GRAVITY RECORDER



LABORATORY TEST METER

Laboratory Test Meters

The only gas meter in the market that can be cleaned at the plant, can be readily taken apart, cleaned and reassembled; accurate, reliable. Patents pending.

Some Users of Precision Gauges

Alabama Power Co., Benoit, Ala.
American Gas & Electric Co., Wellsburg, W. Va.
American Railways Co., Philadelphia, Pa.
Baltimore & Ohio Railroad, Baltimore, Md.
B. F. Goodrich Co., Akron, Ohio
Connecticut Light & Power Co., Waterbury, Conn.
Consolidated Gas & Electric Light & Power Co., Baltimore, Md.
Edison Electric Illuminating Co., Boston, Mass.
Endicott, Johnson Co., Endicott, N. Y.
Interborough Rapid Transit Co., New York, N. Y.
Lehigh Valley Transit Co., Allentown, Pa.
Little Rock Railway & Electric Co., Little Rock, Ark.
Louisville Gas & Electric Co., Louisville, Ky.
Midvale Steel Co., Philadelphia, Pa.
Minneapolis General Electric Co., Minneapolis, Minn.
National Tube Co., Lorain, Ohio
Pittsburgh & West Virginia Railways, Pittsburgh, Pa.
Tennessee Coal & Iron Co., Birmingham, Ala.
United Gas & Electric Corp., New York, N. Y.
Union Electric Light & Power Co., St. Louis, Mo.
West Penn Traction Co., Connellsville, Pa.

THE SCHAEFFER & BUDENBERG MFG. CO.

Instruments for Measuring Pressure, Temperature, Power and Speed

MAIN OFFICE AND WORKS
BROOKLYN, N. Y.

BRANCH OFFICES

PHILADELPHIA, PA. PITTSBURGH, PA.
SAN FRANCISCO, CAL.

CHICAGO, ILL.
DETROIT, MICH.

LOS ANGELES, CAL.
ATLANTA, GA.

WASHINGTON, D. C.
TORONTO, ONT.

Products and Services

GAUGES: Pressure, Vacuum, "Redline Differential" and "U" Draft; GAUGE TESTERS; THERMOMETERS; SEPARATING and THROTTLING STEAM CALORIMETERS; TACHOMETERS; COUNTERS.

Also Gauge Boards, Gauge Glasses, Locomotive Clocks and Barometers.

Without obligation, our Engineering Department will make recommendations, based on 70 years' experience, for increasing production, lowering operating cost and eliminating spoilage of goods by the use of the instruments listed above.

Indicating Gauges

A complete line of S&B pressure, vacuum and draft gauges for all purposes. Have extra heavy, long wearing, non-corrosive movement. Dial is hand calibrated, insuring accuracy. White enameled matt finish eliminates glare and makes reading easy.

Write for catalogue No. A-37.



INDICATING PRESSURE GAUGE

Gas Makers' Gauges

"Columbia" gas makers' gauges are a distinct advance over the hard-to-read, easily broken water column gauge. They are durable, practical instruments, hand calibrated for any desired range (in inches head of water or mercury) for use on blast mains, generators, carburetors, superheaters, wash boxes, condensers, tar extractors, purifiers, meters, holder mains, scrubbers, etc.

Sensitive to the lowest pressures. Ruggedly built to withstand the heavy duty to which a gauge is necessarily subjected in a gas plant. Guaranteed against corrosion. Made in two sizes—6- and 12-in. dials—with instant adjusting key. Electrical contacts for ringing bell or lighting signal lamp at a given pressure furnished when desired.

Write for catalogue No. P-37.



GAS MAKERS' GAUGE

Recording Gauges

"Columbia" and "Schaeffer" recording gauges for accurately recording pressure, vacuum and draft.

Being non-corrosive and especially rugged in construction, the clock movement in these gauges will outwear any other make.

Time punch makes a small hole in disc at exact time button is pressed, thus acting as a time clock. Removable arm makes it easy to renew chart. No danger of straining arm and affecting accuracy of record. Pen is of glass and can be renewed. It can not corrode nor leak. Day and night records are more easily read than on other makes due to wider area.

The "Columbia" is furnished with 8- or 12-in. charts making one revolution in 24 hours, 7 days or other time periods. The diameter of the "Schaeffer" chart is approximately 7 1/2 in.

Write for catalogue No. E-37.



"COLUMBIA" RECORDING GAUGE

Draft Gauges

S&B "Redline" draft gauges have closed front, protecting glass parts against breakage and eliminating exposed cavity where dust ordinarily collects.

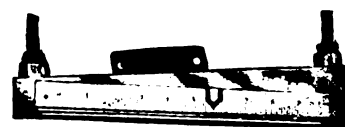
Body is polished aluminum. Indicating column is thoroughly seasoned Jena glass with uniform bore. Scales are accurately calibrated. Spirit level is carefully fitted.

Made in many designs and types for measuring drafts.

Write for catalogue No. C-37.



"U" TYPE DRAFT GAUGE



"REDLINE" DIFFERENTIAL DRAFT GAUGE

Gauge Testers

Among the many types of S&B gauge testers for testing gauges of all types and capacity, there is sure to be an apparatus that is compatible with every need.

Write for catalogue No. D-3.



GAUGE TESTER

Indicating Thermometers

Among our line of high grade "Crescent" thermometers will be found those used in every industry. Also many other types for diverse industrial requirements.

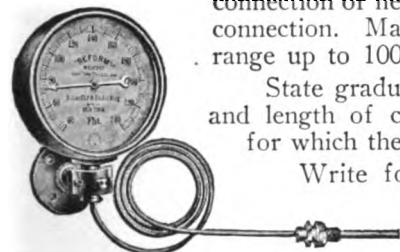
Write for catalogue No. F-37.

"Reform" Thermometers—A dial face, mercury-filled indicating thermometer having the accuracy of the standard glass tube thermometer and the reading convenience of a dial face. Entire working mechanism is made of steel, meaning long life.

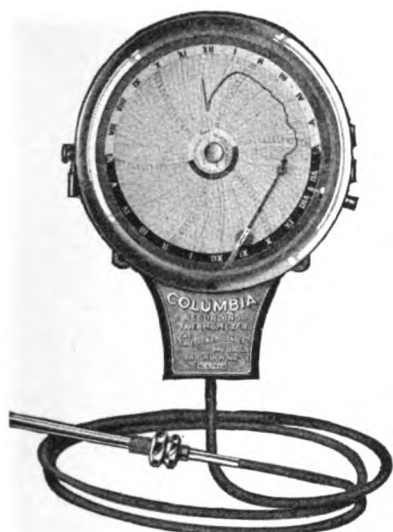
Standard size of dial, 6 in. Other sizes made to order. Furnished with either rigid connection or flexible capillary steel tube connection. Made for any temperature range up to 1000° Fahr.

State graduation desired, character and length of connection and purpose for which thermometer is to be used.

Write for catalogue No. G-37.



"CRESCENT" INDICATING THERMOMETER



"COLUMBIA" RECORDING THERMOMETER



"COLUMBIA" RECORDING THERMOMETER IN MOISTUREPROOF, FUMEPROOF AND DUSTPROOF CASE

Recording Thermometers

"Columbia" and "Schaeffer" recording thermometers give authentic records of temperature up to 1000° Fahr. Three types, actuated by either mercury, gas or vapor tension.

Clock movement is ruggedly built for long service; will not corrode. Responds instantly to slightest temperature changes and guaranteed to be accurate.

Time punch makes a small hole in disc at exact time button is pressed, thus acting as a time clock.

Removable arm makes renewal of chart easy and eliminates possibility of straining arm and affecting accuracy of records.

Renewable glass non-spilling and non-corroding pen insures dependable, readable records.

Day and night chart has wider area than usual, giving a more readable record.

Tubing is fumeproof, acidproof and waterproof and practically indestructible.

The "Columbia" has won universal approbation for its accuracy and durability. The "Schaeffer" is a less expensive offspring of the "Columbia." The latter can be furnished with 8- or 12-in. charts; the "Schaeffer" with chart approximately 7½ in. in diameter.

Write for catalogue No. H-37.

Calorimeters

We manufacture Professor Carpenter's pattern calorimeters for steam.

The throttling type of steam calorimeter serves for determining the amount of moisture contained in steam by measurement of the heat. The separating type is designed to show the percentage of water by mechanical separation of the water from the steam.



CALORIMETER

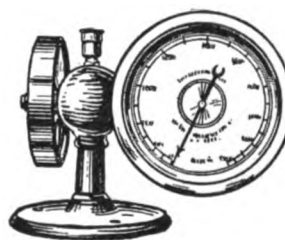
S&B calorimeters are easily operated, requiring no technical knowledge and results are most satisfactory for practical problems.

Write for catalogue No. M-37.

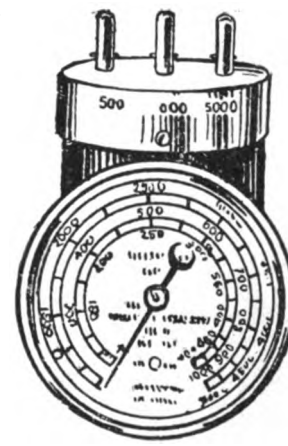
Tachometers

For measuring speeds of shaftings, machines, motors, turbines, etc. directly in revolutions per minute. S&B tachometers are made in several types, both hand and stationary. The latter are for permanent connection, of both indicating and recording types, for all applications.

Write for catalogue No. J-37.



HAND TACHOMETER



STATIONARY TACHOMETER

Counters

S&B indicating and recording counters are made for diverse requirements, as are also S&B operation recorders, for recording the frequency, time of occurrence and duration of all mechanical operations.

We are equipped to build special counters for special requirements.

Catalogue No. L-37 on request.



SQUARE CASE COUNTER



ENGINE REGISTER COUNTER

THWING INSTRUMENT COMPANY

3352 Lancaster Avenue
PHILADELPHIA, PA.

BRANCHES

BOSTON, MASS., 141 Milk Street
CLEVELAND, OHIO, 10312 Olivet Avenue
DETROIT, MICH., 417 Lightner Building
LOS ANGELES, CAL., 726 South Hope Street

TORONTO, ONT., Royal Bank Building

NEW YORK, N. Y., 45 West 18th Street
PITTSBURGH, PA., 816 Ivy Street
SAN FRANCISCO, CAL., 155 Second Street
SEATTLE, WASH., 635 Burke Building

Products

THWING THERMO-ELECTRIC and RADIATION PYROMETERS; RESISTANCE THERMOMETERS; INDICATING and SINGLE and MULTIPLE RECORDING SYSTEMS for measuring all temperatures between -250° to 3000° Cent. (-420° to 5500° Fahr.).

Thwing Multiple Recording System

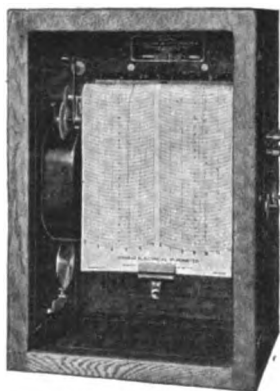
A Thwing multiple-record indicating and recording pyrometer system is a real necessity wherever heat conditions are to be measured or controlled.

The recorder in the office keeps the conditions at every heat source constantly under the manager's observation, warns of irregularities, checks inexperienced men, detects the shirkers and gives *permanent* records. These records afford the best possible means of determining and duplicating the ideal time and heat relation for perfect product, minimum fuel consumption and for maximum plant capacity, through completion of the process in the shortest possible time. The Thwing multiple system of recording produces 1 to 12 records on a single chart and thereby avoids extra expense of additional instruments, charts, etc.

The indicators at the heat sources enable attendants to keep their fires right at all times to avoid losses from overheating or underheating.



WALL PATTERN INDICATOR



6-RECORD RECORDER

Thwing pyrometers are made in the following types:

Type "A" (Thermo-electric)—For temperatures from 100° Cent. (200° Fahr.) to 1600° Cent. (2900° Fahr.).

Operation is based upon measurement of the electric current generated by insertion of the "hot end" of a thermo-couple into the temperature to be measured.

The thermo-couple is made of base metal or platinum, with outer protection of fused quartz, porcelain, clay, iron, etc., as conditions require, and when installed

as directed will give continuously accurate results with very low expense for renewals.

Type "B" (Radiation)—For temperatures from 500° Cent. (925° Fahr.) to 3000° Cent. (5500° Fahr.).

This is the quickest acting pyrometer made and is accurate to the highest temperatures. No part enters the fire nor does the operator have to get uncomfortably close to the heat. The construction is simple, practical and very durable; and as no focusing, leveling or reference to tables is required, readings can be taken in rapid succession.

Made for both portable and stationary use and particularly desirable for reading temperatures in furnaces, ovens, kilns, fire pits and within moving molten metal and other material.

Type "C" Resistance Thermometer—For temperatures from -250° Cent. (-420° Fahr.) to 200° Cent. (400° Fahr.) and in special cases up to 425° Cent. (800° Fahr.).

This instrument is based upon measurement of the resistance to an electric current passing through a bulb of fine wire located at the point of temperature measurement. The resistance type is most used for measuring low temperature where the cold ends of a thermo-couple can not easily be kept at constant temperature.



GOLD MEDAL AWARD PAN-AMA PACIFIC EXPOSITION 1915



PORTABLE RADIATION PYROMETER

Engineering Service

Wide experience and records of performance in about every imaginable temperature measurement peculiarly fit this company to offer correct advice. *Gladly and without charge special reports will be rendered and desirable arrangements for difficult conditions suggested.*

Literature

Literature with detailed description of any type of Thwing instrument and giving valuable hints on pyrometer selection and use will be sent free on request.

UEHLING INSTRUMENT COMPANY

Power Plant Economy Apparatus

CABLE ADDRESS
"UEHLINCO, NEW YORK"

2016 Empire Building
NEW YORK, N. Y.

BRANCH OFFICES, BOSTON AND CHICAGO

Products

Manufacturers of RECORDING INSTRUMENTS, which include Uehling CO₂ Recording Equipment; Combined CO₂ and Temperature Recorders; Combined Barometer and Vacuum Recorders; Absolute Pressure Indicators; Pressure and Vacuum Recorders.

Also manufacturers of Hand CO₂ Machines, Pyrometers, Waste Meters, Differential Pressure Recorders, Draft Recorders and Indicators.



Uehling Recording Instruments

The distinctive features of Uehling recording instruments are simplicity, accuracy and reliability. They are based on the hydrostatic principle, by the application of which all springs, levers and joint movements are avoided.

In addition to these important advantages, the hydrostatic principle permits of making the scale open between the limits where the readings are important and narrow where they are unimportant, or eliminating that part of the scale altogether which is of no use, thus utilizing the whole width of the chart for important readings.

The foregoing principles are illustrated by the drawings of Uehling vacuum recorder and Uehling pressure recorder reproduced herewith.

Combined Barometer and Vacuum Recorder

For power plants, particular attention is drawn to the Uehling combined barometer and vacuum recorder which puts a record of both the barometric pressure and vacuum on the same chart. The distance between the two records, therefore, always represents the absolute back pressure.

This recorder is most accurate and is meeting with much favor as applied to condensing plants.

Special Instruments

This company also has a department for designing and developing special instruments for special purposes.

Uehling CO₂ Recording Equipment

Uehling CO₂ recording equipment provides the simplest means for keeping continuous check on the fuel wasted up the chimney.

It is made up in both single and multiple form for either one boiler or a battery.

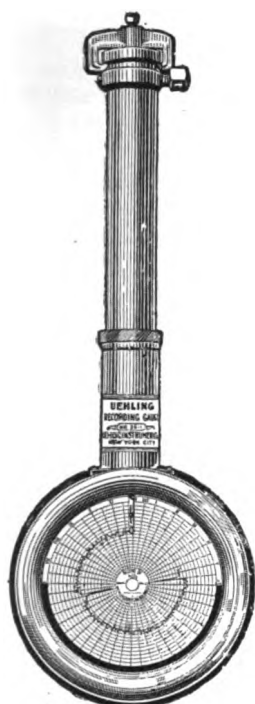
With each unit is included a recorder which can be located in the office of the chief engineer or superintendent, and an auxiliary CO₂ indicator which can be located at the boiler front for the fireman's guidance, by means of which he can be held responsible for the record produced and thus for the fuel wasted up the chimney.

The continuous and uninterrupted record is made on an 8-in. circular chart, or on a rectangular chart if desirable.

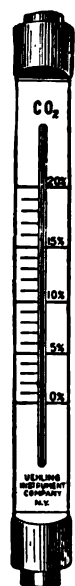
Absolute Pressure Indicator

The fact that the accuracy of all vacuum measuring devices is affected by any change in barometric pressure led to the development of the Uehling absolute pressure indicator, which measures the absolute pressure in any chamber and is entirely independent of any change in atmospheric pressure.

Mercury is used as the indicating medium.



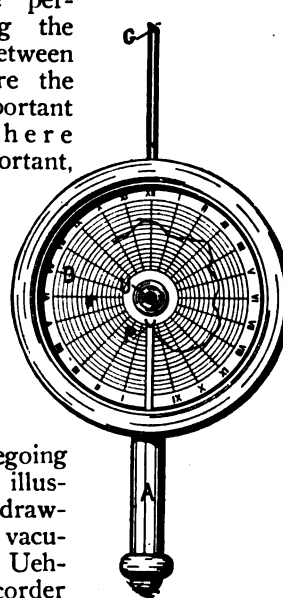
CO₂ RECORDER



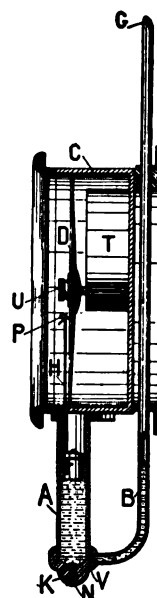
BOILER
FRONT
CO₂ IN-
DICATOR



ABSOLUTE
PRESSURE
INDICATOR



UEHLING VACUUM RECORDER



UEHLING PRESSURE RECORDER

PACIFIC TANK GAUGE CO.

167 Jessie Street
SAN FRANCISCO, CAL.

BRANCH OFFICES

LOS ANGELES, CAL., 318 Bumiller Building
SEATTLE, WASH., 107 Seneca Street

BOSTON, MASS., 96 High Street
CHICAGO, ILL., 7224 Constance Avenue
PORTLAND, ORE., 211 Henry Building

Product

The PACIFIC TANK GAUGE, for indicating the exact quantity of any liquid in any form of container.

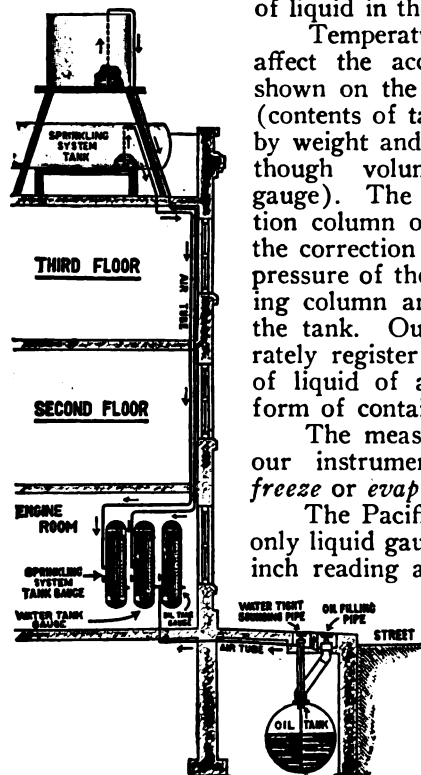
Scope of Use

Adapted for any kind of tank, open or closed, containing any liquid, such as oil, gasoline, mineral and vegetable oils, acids, molasses, syrups, water, etc., regardless of temperature of liquid; also sprinkling systems.

Special Features of the Pacific Tank Gauge

Any number of tanks can be served by one instrument with the calibration arranged to indicate different gravities.

We have a system of compounding our gauges with a system of valves whereby tanks of a greater depth than 8 ft. can be measured on a 5-, 6- or 7-ft. gauge, giving a full inch reading corresponding to the depth of liquid in the tank.



TYPICAL INSTALLATION OF THE PACIFIC TANK GAUGE

Gauges attached to water tank, sprinkling system tank and an underground oil storage tank

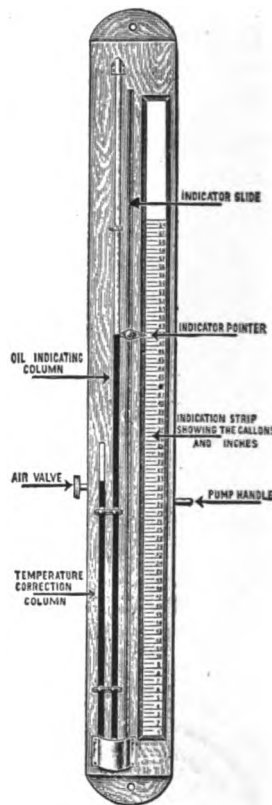
Our gauge may be arranged to control a motor driven pump so as to automatically maintain a predetermined minimum and maximum quantity of liquid in the container.

All mechanical features of this equipment are readily accessible.

Simplicity of Construction and Installation

The Pacific tank gauge mechanically is very simple, there being no moving parts such as floats, diaphragms or electric connections which are constantly getting out of order. The gauge is simply hung where most convenient to take readings and connected with the storage tank.

A pipe open at the lower end is inserted through the top of the tank, manhole, filling or sound pipe, etc. This tube which is filled with air during its operation displaces a column of fluid in the tank, thus creating a slight pressure within the tube. This air pressure, transmitted to the gauge through the medium of a small tubing, balances a column of liquid at the distant gauge irrespective of the relative elevation of the gauge.



PACIFIC TANK GAUGE
(Patent applied for)

Pacific Tank Gauge Promotes Efficiency

It will show at a glance the exact number of gallons of liquid in the tank, as well as the amount added or taken from tank. It also shows how much liquid the tank will accommodate at any time. In this way it is possible to keep account of just how much oil is being used in any part of the plant, and facilitates comparisons of boiler efficiencies.

Quotations and Guarantee

Quotations furnished, based on size of storage tank and its distance from gauge to be installed.

The Pacific tank gauge is guaranteed to register correctly, at a mile distant from a storage tank, the volume of liquid in a tank at all times. Free service is also offered at all times.

PNEUMERCATOR COMPANY, INC.

Sperry Building, 40 Flatbush Avenue Extension
BROOKLYN, N. Y.

EUROPE: KELVIN, BOTTOMLEY & BAIRD, LTD., GLASGOW, SCOTLAND

Product

"PNEUMERCATOR" GAUGES for indicating the depth and weight or volume, specific gravity, or Baumé of any liquid, fluid or viscous, acid or alkaline at any temperature. They provide perpetual inventory data of the liquid stored, put in or withdrawn from tanks, standpipes and reservoirs.

Applications

Fuel oil, gasoline, acid, chemical, sprinkler tanks, reservoirs, standpipes, flumes, tail races, dams, water works, tide fluctuations, stills, molasses tanks, evaporators, etc.

Principle

The operation of all models of "Pneumercator" Gauges is based on the maintenance of a true hydrostatic balance between the head of the liquid to be measured and a column of mercury or other indicating medium, the pressure being transmitted by air confined in a small connecting tube between the liquid and the gauge.

It will operate with equal accuracy on tanks open to the atmosphere or under pressure or vacuum, and its accuracy is not affected by changes of temperature of the liquid or of the buildings through which the connecting pipe passes.

There are no floats, diaphragms or delicate mechanisms to stick or get out of order.

Construction

(1) A balance chamber or chambers located in the liquid to be measured.

(2) A mercury or other gauge, located wherever it is desired to take readings.

(3) Hand pump or other compressed air source.

(4) Control valve attached to gauge and connected by small piping to compressed air source.

Types of "Pneumercator" Gauges

Type STI—Applicable to any tank whose contents have a constant specific gravity and where a reading in units of depth, weight or volume is desired. Also applicable to a straight sided tank whose contents vary in specific gravity, where an accurate reading in weight is desired. May also be applied to a horizontal cylindrical tank whose contents vary in specific gravity, where an approximate reading in depth, weight or volume is sufficient.

Scales graduated in units of depth, weight or volume corresponding to each half-inch tank depth. Furnished in 5 sizes: 16, 24, 32, 40 and 48 in., for tanks not exceeding 50 ft. in depth (based on a tank of fresh water of 1. specific gravity).

Type STI Electrical Gauge—Similar to the standard STI type, except that it is fitted with an annunciator which warns the engineer when a predetermined level is reached.

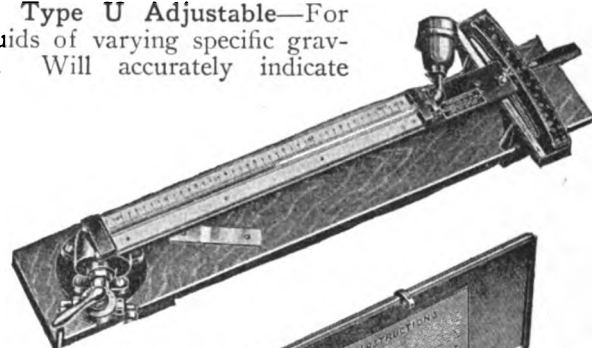
Type U Fixed—Practically the same as Type STI except that, being inclined at 30°, it gives closer readings. Graduated to read in units of depth, weight or volume with

Trade Mark Reg. U.S. Pat. Off.
Pneumercator

a mark for each quarter-inch of tank depth. Made in 4 sizes: for tanks not exceeding 10, 15, 20 or 30 ft. in depth or diameter.

Type CTI—Has applications similar to Type STI but is designed to serve where extreme refinement is not required. Made in 3 sizes for tanks 10, 20 or 30 ft. in depth or diameter.

Type U Adjustable—For liquids of varying specific gravity. Will accurately indicate



TYPE U ADJUSTABLE GAUGE

contents in units of depth, weight or volume. Can be equipped with specific gravity finder which enables the operator to determine the average specific gravity or Baumé of the tank contents. Applicable to all tanks 10, 15, 20, 30 or 50 ft. in diameter or depth.



TYPE CU ADJUSTABLE GAUGE

Type CU Adjustable—The same in principle as Type U described above, except that a simple shut-off valve replaces the 3-way cock; the air pump and gauge are enclosed in an aluminum case and the balance chamber is smaller.

General

All "Pneumercator" Gauges may be manifolded to a number of tanks of the same size, but we do not recommend manifolding to more than 6 tanks. Contents of each tank must be read individually.

Quotations

As each "Pneumercator" Gauge has to be made up for the specific purpose for which it is to be used, in order to advise and quote you intelligently, it is necessary that we have the following information:

- (1) The dimensions of tank (or tanks).
- (2) The distance from the tank to the point where the indicating section of the instrument is to be located
- (3) The nature and specific gravity of the liquid to be measured.

Prices and full information will be promptly furnished on request.

Trade-mark

The coined word "Pneumercator" is registered as our trade-mark and attached to all instruments sold by us, our representatives and licensees under our patents, throughout the world.



TYPE STI GAUGE

AMES IRON WORKS

Manufacturers of Engines and Boilers

OSWEGO, N. Y.

BRANCHES IN ALL PRINCIPAL CITIES

Products

AMES ENGINES include various types of Una-flow; Automatic and Throttling, Single Valve Center and Side Crank; Twin Variable Speed for paper mill drive.

AMES BOILERS include Horizontal Return Tubular; Return Tubular Portable; Locomotive; Upright; Portables on wheels and skids; also special types to order.

Also manufacturers of Smokestacks, Tanks and Special Plate Work.

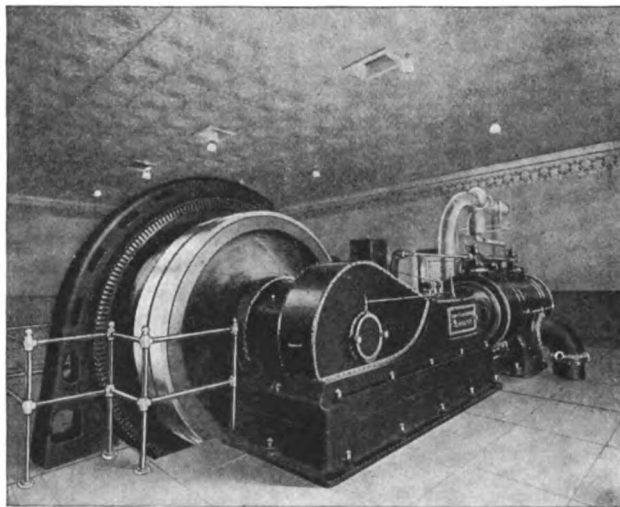
Ames Engines

Ames Una-flow Engines—Built in "Fixed" and "Controlled Compression" types from 50 to 1000 h.p. for non-condensing and condensing service, and to meet all operating conditions, including highly superheated steam, and to exhaust against moderately high back pressures. These engines can be furnished for constant and variable speed operation, for direct shaft connection to ammonia compressors, centrifugal pumps and other equipment.

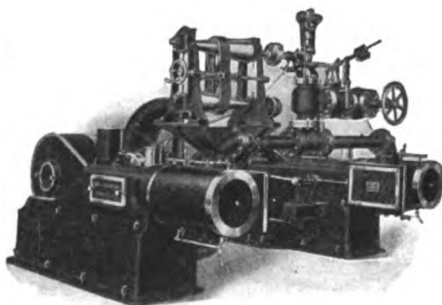
Ames Una-flow engines will be furnished of proper type to secure maximum fuel economy as referred to specified conditions.

Ames Side and Center Crank, Single Valve, Automatic Engines—For medium and high speed operation in sizes up to 500 h.p. For direct and belted connection to generators, line shafts, blowers, pumps and other equipment.

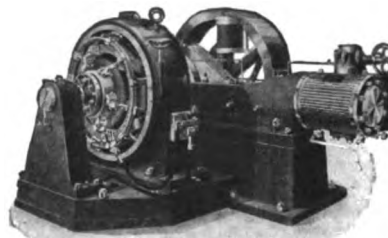
Ames Twin Variable Speed Engines—The most efficient and reliable of their type. Highly recommended for paper mill drives.



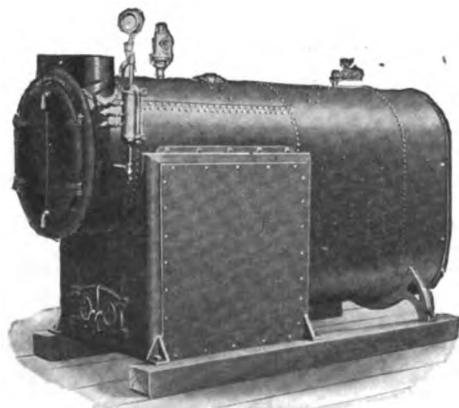
UNA-FLOW ENGINE DIRECT CONNECTED TO 450 Kw. GENERATOR



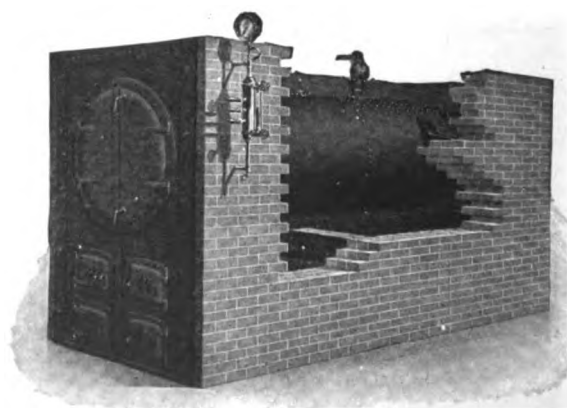
VARIABLE SPEED TWIN SINGLE VALVE ENGINE FOR PAPER MILL DRIVE



CENTER CRANK AUTOMATIC ENGINE FOR BELTED AND DIRECT CONNECTED GENERATOR SERVICE



EMPIRE RETURN TUBULAR PORTABLE BOILER



HORIZONTAL TUBULAR BOILER

Ames Boilers

Built for all pressures and to meet all commercial requirements.

Horizontal Return Tubular Boilers—With flush and arch fronts for brick settings and of lug and suspended types, also steel cased suspended types. Sizes, 15 to 200 h.p.

Empire Return Tubular Portable Boilers—Self-contained type for either portable or permanent settings. Built for low and high pressure service. Sizes, 15 to 150 h.p.

Firebox Heating Boilers—Self-contained type. High or low pressure service. With plain furnaces; also with down-draft furnaces for smokeless combustion of soft coal. Sizes, 2,500 to 25,000 sq. ft. radiation.

Bulletins

Will be sent on request.

SKINNER ENGINE COMPANY

ERIE, PA.

BRANCH OFFICES IN ALL PRINCIPAL CITIES

Products

"UNIVERSAL UNAFLOW" STEAM ENGINES and SKINNER STEAM-TIGHT-VALVE COUNTERFLOW ENGINES.

"Universal Unaflow" Engines

The "Universal Unaflow" engine is the most economical steam prime mover built today. Proof of its superior economy has been substantiated by over 600 tests. This engine is built in capacities of from 100 to 1500 h.p. in side crank type and 100 to 400 h.p. in center crank type.

The "Universal Unaflow" engine is built only by this company and is arranged for noncondensing and condensing operation without any change. It automatically adjusts itself to the different exhaust pressure conditions.

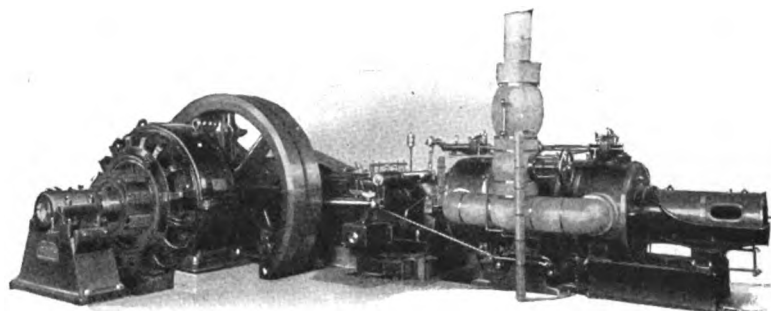
One of the characteristics of the "Universal

South America, Europe, Cuba, Canada, the Philippines and in practically every section of the United States. The economy and dependability of the "Universal Unaflow" engine are shown by the fact that in the year 1921 over 45% of the SKINNER ENGINE COMPANY'S business was "repeat orders."

Steam-Tight-Valve Counterflow Engines

The Skinner Steam-Tight-Valve Counterflow engine is in operation in 10,000 plants in the United States. It shows superior economy, after years of use, to multi-valve counterflow engines, on account of the fact that the original economy of the Skinner engine is maintained because valve leakage has been entirely eliminated.

This engine is built in single cylinder type only, and in capacities of 100 to 600 h.p. in side crank engines, and 30 to 450 h.p. in center crank engines.



"UNIVERSAL UNAFLOW" ENGINE

Unaflow" engine is that it gives an almost flat steam consumption curve from 25% to 125% of rated capacity, showing complete absence of valve leakage and initial condensation.

The "Universal Unaflow" engine has steam-tight poppet valves. The entire valve gear has only fourteen joints and is under the control of an automatic shaft governor, giving extremely close regulation. The smaller sizes operate at speeds as high as 277 r.p.m. and the larger engines operate at 150 r.p.m. The heavy duty construction and close regulation make the engine especially adapted to electric generator service.

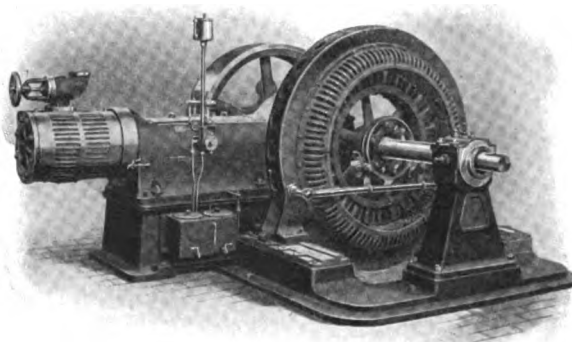
These engines are in operation in India, China,

Heavy Duty, Variable Speed Engines

The SKINNER ENGINE COMPANY also builds several types of heavy duty, variable speed engines, in both the "Universal Unaflow" and Steam-Tight-Valve Counterflow design, for various classes of service.

Skinner System of Automatic Lubrication

All Skinner engines are equipped with the Skinner System of Automatic Lubrication (patented), which filters and cools the oil, separates it from the water and returns it to the bearings of the engine in a pure, clean condition.



STEAM-TIGHT-VALVE COUNTERFLOW ENGINE

TROY ENGINE & MACHINE CO.

Manufacturers of Steam Engines Exclusively

TROY, PA.

Products

TROY VERTICAL and HORIZONTAL STEAM ENGINES for every service, within capacities of 2 to 180 h. p.

Troy Vertical Automatic Engine

Self-oiling with enclosed frame, or cup lubrication; with two wheels for belted service or extended base for direct connection to generator. Equipped with Rites inertia governor, giving perfect balance. Regulation and stability obtained by weighting arm at one or both ends and by adjustment of coil spring. Variation between no load and full load seldom exceeds 2%.

Speed adjusted at standard revolutions as per table unless otherwise ordered. Standard driving pulley has same diameter and face as governor wheel. Equipment includes lubricator, drain cocks, throttle valve, wrenches, etc.

Troy Horizontal Automatic Engine

Two methods of lubrication—self-oiling or tank gravity system. Steam pressures, 60 to 160 lbs.; special cylinders for higher pressures. Sub-base used with self-oiling engines contains oil reservoir and fittings. Full equipment. Speed and direction of rotation should be specified.

VERTICAL AND HORIZONTAL AUTOMATIC ENGINES

Cyl- in.	Revolutions, per min.				Brake h. p. ¾ cut-off	Gov. wheel driving pulley			Shaft, in.	Pipes, in.	Floor, space, in.	Approx. shipping weight, lb.				
Diameter	Stroke	Lowest	Standard	Highest	100 lbs. pressure 300 r.p.m.	1 lb. pressure 1 r.p.m.	Diameter, in.	Face, in.	Weight of gov. wheel, lbs.	Diameter	Length	Supply	Exhaust	Belted, 2 wheels	Belted, 2 wheels	D. C. extended base
3½	4	400	400	600	12.96	.000074	20	3½	130	1½	22½	1	1½	20x 23	750	950
4½	5	400	400	600	16.44	.000161	24	4½	175	1½	27	1	1½	24x 27	950	1150
5	6	300	300	500	9.35	.000312	30	5	215	2½	32½	1½	1½	31x 33	1850	2100
6	7	300	300	500	13.35	.000449	30	6	215	2½	32½	1½	2	31x 33	1900	2200
7	7	300	300	500	18.36	.000612	30	6½	215	2½	32½	2	2	31x 33	1980	2250
7	7	300	300	475	20.97	.000699	36	8	260	3	32½	2	2	36x 41	2900	3200
8	8	300	300	450	27.39	.000913	36	8½	310	3	32½	2	2½	36x 41	2980	3250
9	9	275	275	450	39.03	.001301	40	9½	330	3½	32½	4	2½	40x 48	4300	5600
10	10	275	275	400	43.20	.001440	44	10½	350	4	32½	4	3	44x 56	5200	6600
11	10	275	275	400	53.52	.001784	44	10½	350	4	32½	4	3	44x 56	5400	6800
11	10	275	275	400	64.74	.002158	44	10½	350	4	32½	4	3	44x 56	5600	7000
12	12	275	275	350	64.26	.002142	54	12½	425	5	32½	4	5	54x 62	8200	9700
12	12	275	275	350	92.52	.003084	60	12½	470	5	32½	5	5	60x 62	8700	10200
14	14	225	225	300	112.42	.004897	80	14½	550	6	32½	6	6	60x 76	15000	18500

†Power rating at 400 r.p.m. ‡Power rating at 250 r.p.m.

HORIZONTAL AUTOMATIC ENGINES

7	8	300	300	475	20.97	.000699	36	8½	610	3	39½	2	2½	41x 72	3750	3900
8	9	300	300	450	27.39	.000913	36	8½	610	3	39½	2	2½	41x 72	3800	3950
9	10	275	300	450	39.03	.001301	40	9½	930	3½	46	2½	3	47x 82	5600	5800
10	10	275	300	400	43.20	.001440	44	10½	1050	4	53	3	4	53x 89	6400	8100
10	12	275	300	400	53.52	.001784	44	10½	1050	4	53	3	4	53x 89	6800	8300
11	10	275	300	400	64.74	.002158	44	10½	1050	4	53	3	4	53x 89	6800	8500
12	12	275	300	350	64.26	.002142	54	12½	1500	5	57½	4	5	62x105	9600	11000
12	12	275	300	350	92.52	.003084	60	12½	1700	5	57½	4	5	62x105	10000	11200
14	14	225	250	300	112.42	.004897	80	14½	2250	7	76	4½	6	76x123	16500	18000

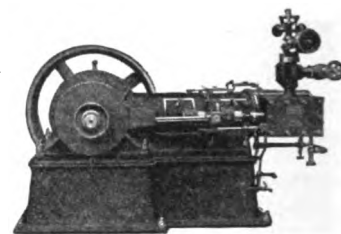
†Power rating at 250 r.p.m.

Troy Vertical Throttling Engines

The Troy special balanced slide valve is standard equipment in all sizes. Special cylinders are made for extra high steam pressures, or for superheat. Engine self-oiling, or cup lubrication. Full equipment supplied. Also built duplex or in pairs to suit customers.

Troy Horizontal High Pressure Throttling Engines

Sizes from 15 h. p. up. Massive frame and base. Self-oiling system or tank gravity lubrication. Left-hand engines, as illustrated, are standard. Special equipment for direct connection to fans, blowers, pumps, etc.



HORIZONTAL THROTTLING ENGINE

Experience

Troy engines are the result of 30 years' experience in the design and construction of steam engines. The benefit of this experience is offered to our patrons.

Prompt Delivery

We endeavor to keep all sizes of standard engines constantly in stock for prompt shipment.

VERTICAL AND HORIZONTAL THROTTLING ENGINES

Cylinder, in.		Revolutions per minute	Brake, h. p. ¾ cut-off		Flywheel in.		Shaft, in.		Pipes, in.		Engine, with standard pulley	
Diameter	Stroke		90 lbs. steam pressure	1 lb. pressure 1 r.p.m.	Diameter	Face	Diameter	Length	Supply	Exhaust	Floor space, in.	Approx. shipping weight, lbs.
3½	4	300	2.21	.000082	16	3½	1½	23½	1	1½	20x 23	500
4½	5	300	4.81	.000178	20	4½	1½	29½	1	1½	24x 30	750
5	7	250	7.80	.000346	26	5	2½	36	1½	1½	31x 36	1380
6	7	250	11.20	.000499	26	6	2½	36	1½	1½	31x 36	1460
7	7	250	15.34	.000682	26	6½	2½	36	1½	2	31x 36	1550
7	8	250	17.32	.000770	36	8½	3	42½	2	2	36x 43	2300
8	8	250	22.80	.001014	36	8½	3	42½	2	2½	36x 43	2500
9	9	250	32.40	.001440	40	9½	3½	53	2½	3	40x 49	3800
9	10	250	36.00	.001600	44	10½	4	57	3	4	44x 56	4400
10	10	250	44.55	.001980	44	10½	4	57	3	4	44x 56	4600
11	10	250	54.00	.002400	44	10½	4	57	3	4	44x 56	4800
10	12	250	53.55	.002380	54	12½	5	64½	3	5	54x 68	6800
12	12	250	77.10	.003427	54	12½	5	64½	3½	5	54x 68	7000
14	12	250	102.44	.004664	54	12½	5	64½	4	5	54x 68	7300
14	14	225	122.42	.005441	60	14½	7	66	4	6	60x 68	13500
16	14	225	160.00	.007108	60	14½	7	66	5	7	60x 68	14000

VERTICAL THROTTLING ENGINES, HIGH PRESSURE TYPE

8	5	250	3.15	.00063	20	4½	1½	29½	1½	2	23x 30	950
10	7	250	6.50	.00130	26	6½	2½	36	2	2½	31x 36	1800
12	7	250	9.50	.00190	26	6½	2½	36	2½	3	31x 36	2000
14	7	250	13.50	.00272	26	6½	2½	36	3	3½	31x 36	2400
12	8	250	11.40	.00228	36	8½	3	42½	3	3½	36x 43	3000
15	8	250	17.65	.00353	36	8½	3	42½	3	3½	36x 43	3200
12	9	250	12.85	.00257	40	9½	3½	53	3	4	40x 53	4000
18	9	250	28.90	.00578	40	9½	3½	53	4½	6	40x 53	4600
15	10	250	22.30	.00446	44	10½	4	57	3½	4	44x 57	5000
16	12	250	30.45	.00609	54	12½	5	64½	4	5	54x 68	7600
18	12	250	38.50	.00770	54	12½	5	64½	5	7	54x 68	7800

HORIZONTAL THROTTLING ENGINES, HIGH PRESSURE TYPE

7	8	250	17.32	.000770	36	8½	3	42½	2	2	43x 72	3300
8	8	250	22.80	.001014	36	8½	3	42½	2	2½	43x 72	3400
9	9	250	32.40	.001440	40	9½	3½	53	2½	3	53x 82	4700
9	10	250	36.00	.001600	44	10½	4	57	3	4	57x 89	5600
10	10	250	44.65	.001980	44	10½	4	57	3	4	57x 89	5800
11	10	250	54.00	.002400	44	10½	4	57	3	4	57x 89	6000
10	12	250	53.55	.002380	54	12½	5	64½	3	5	65x105	7800
12	12	250	77.10	.003427	54	12½	5	64½	3½	5	65x105	8000
14	12	250	102.44	.004664	54	12½	5	64½	4	5	65x105	8200
14	14	225	122.42	.005441	60	14½	7	66	4	6	66x123	15000
16	14	225	160.00	.007108	60	14½	7	66	5	7	66x123	15500

HORIZONTAL THROTTLING ENGINES, LOW PRESSURE TYPE

12	8	250	11.40	.00228	36	8½	3	42½	3	3½	43x 73	3800
15	8	250	17.65	.00353	36	8½	3	42½	3	3½	45x 73	4000
12	9	250	12.85	.00257	40	9½	3½	53	3	4	54x 82	5000
18	9	250	28.92	.00578	40	9½	3½	53	4½	6	56x 82	5300
15	10	250	22.30	.00446	44	10½	4	57	3½	4	57x 90	6200
16	12	250	30.45	.00609	54	12½	5	64½	4	5	65x106	8600
18	12	250	38.50	.00770	54	12½	5	64½	5	7	65x106	8900

THE BESSEMER GAS ENGINE CO.

Manufacturers of Fuel Oil Engines

GROVE CITY, PA.

BRANCH OFFICES AND SERVICE STATIONS

NEW YORK, N. Y.
PITTSBURGH, PA.

PARKERSBURG, W. VA.
TULSA, OKLA.

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MEMPHIS, TENN.
LOS ANGELES, CAL.

AND MANY FOREIGN CITIES

Products

BESSEMER FUEL OIL ENGINES, Type OD, Single Cylinder 15 to 35 h.p.; Type IV, Single Cylinder 25 to 85 h.p.; Type IV, Twin Cylinder to 180 h.p.

Also manufacturers of Bessemer Gas Engines and Oil Field Equipment.

Bessemer Fuel Oil Engines

Economy—Standard average fuel cost in dollars and cents for 1000 h. p. hr. of steam, electric and Bessemer power show that relative costs are \$9.63, \$25.50 and \$4.13, respectively. These costs were figured on the bases of 5 lbs. of coal per h. p. hr. at \$3.50 per ton + 10% standby loss, for steam; 750 kw. at \$.03 per kw-hr. for electric power; 0.66 pt. per h. p. hr. at \$.05 per gal. for fuel oil for Bessemer power.

Operation—Bessemers will operate with equally good economy and without troublesome deposits on cheap fuel oils of paraffin base, asphalt base, or cracked oils, within a wide range of specifications. They will also burn alcohol. A fuel oil of 24° to 28° Baume is recommended, although Bessemers have operated successfully (to pass government tests) on the cheapest of fuels even down to asphalt crude of 17°.

Contrasted with steam, Bessemer power not only cuts fuel costs, but increases the saving since no boiler, firemen or licensed engineers are required. Bessemers occupy less floor space. There are no standby losses and fuel is consumed only when power is being used. Bessemers have every advantage of the steam engine, governor control, quiet operation, practically no power fluctuation or vibration, etc., but none of the shortcomings of the steam engine.

Features of Design—Bessemer oil engines are of the two-stroke cycle type, time-tried and tested under the most severe conditions. There are no power requirements too exacting for the Bessemer. Bessemers have never failed to meet the most perfect regulation necessary in driving electric generators, or the power requirements of mills, mines, irrigation work or any industrial uses within their capacities. The governor affords control within 2% from no load to full load. The use of a crosshead in all types means long life with a minimum of adjustment or repairs. There is no undue wear on the cylinders due to the angular thrust of the connecting rod; this thrust falls on the crosshead, which has wide adjustment for wear, and not on an unadjustable cylinder.

The enclosed crank case provides for splash lubrication of crosshead, crank, crank pin and main shaft bearings. By means of this effective method these parts are constantly exposed to an oil bath. Mechanical force feed lubrication of the cylinders insures the right amount of oil reaching the right place at the right time.

Construction—Bessemer engines are of simplified and rugged construction and are built from pig iron to complete engine in our own plant. Our plant equipped with every modern machine for engine production, plus close inspection all through the process of manufacture



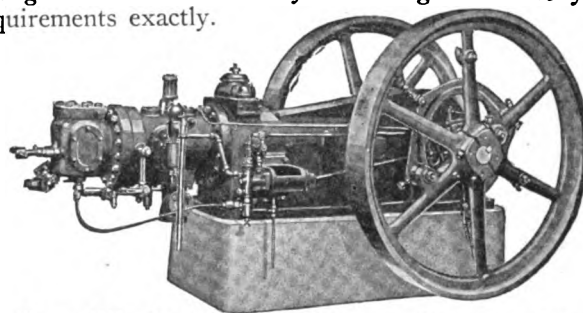
TRADE-MARK

allows us to guarantee that every Bessemer Engine will give completely satisfactory service even under the most severe conditions.

Co-operative Service

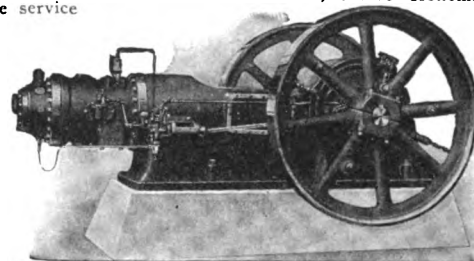
Write for our Oil Engine Catalogue. Specify your present means of power production and its cost and we can then tell what Bessemer power will save for you.

Our twenty-four years' experience in engine building covering 24,000 installations of oil and gas engines has given us the necessary knowledge to meet your requirements exactly.



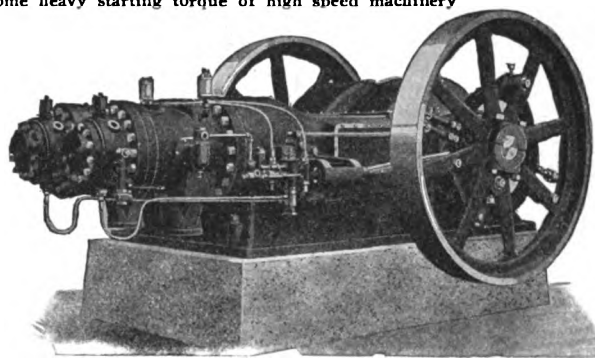
TYPE OD BESSEMER OIL ENGINE, GOVERNOR SIDE

Single cylinder, ranging from 15 to 35 h.p. Speed range, 160 to 400 r.p.m. Patented combustion chamber maintains constant temperature regardless of load. Enclosed crank case, variable speed governor, crosshead construction and other features, insure economical and dependable service



TYPE IV BESSEMER OIL ENGINE, SINGLE CYLINDER, GOVERNOR SIDE

25 to 85 h.p. Heavy duty model. Equipped in all sizes with our inertia governor which gives close regulation to meet standard electric guarantees for every class of power plant service. Guaranteed to develop full rated horsepower at shaft and overload capacity sufficient to overcome heavy starting torque of high speed machinery



TYPE IV BESSEMER OIL ENGINE, TWIN CYLINDER, GOVERNOR SIDE

Built up to 180 h.p. Combines all the good features of enclosed crank case, crosshead construction, governor control, heavy construction, etc., but is a twin cylinder type built to furnish greater power than the OD Type or Type IV single cylinder engines

NORDBERG MANUFACTURING CO.

Designers and Builders of Engines, Mine Hoists, Air Compressors, Condensers and Special Machinery
MILWAUKEE, WIS.

Products

DIESEL TYPE STATIONARY and MARINE OIL ENGINES.

CORLISS POPPET VALVE and UNIFLOW POPPET VALVE STEAM ENGINES.

STEAM, AIR and ELECTRIC MINE HOISTS.

AIR COMPRESSORS; BLOWING ENGINES.

CONDENSERS.

GAS COMPRESSORS, CARBON DIOXIDE COMPRESSORS and OXYGEN COMPRESSORS.

VACUUM ENGINES.

Also manufacturers of Steam Stamps.

Diesel Type Stationary and Marine Oil Engines

Nordberg Diesel type stationary and marine oil engines are especially adapted for heavy duty work, and range in sizes from 200 to 3000 h.p. For stationary service they are used extensively in electric light and power plants, flour mills, mining industries, machine-shops, textile works, cement industries, water works, shipyards, chemical works, refineries, compressor plants, irrigation plants, ice manufacture, etc. Nordberg Diesel engines are made for either constant or variable speed, and when operated at variable speed can be used in connection with compressors, blowing engines, pumps, ice machines, etc. For operation at high elevations and for continuous non-stop service they will be found particularly well adapted. They burn a large variety of fuel oils with exceptional economy. Attention is called to the large sizes of Nordberg marine and stationary units. Write for Diesel Engine Bulletin No. 31.

Steam Engines

The Nordberg-Todd uniflow poppet valve engines are the highest type of steam prime movers known. Producing exceptional operating economies when new, they maintain them over a long period of years. The Uniflow engines have poppet valve gears; furnished in sizes of 200 h.p. and up. Any one Nordberg Uniflow engine may be operated condensing, non-condensing or with high back pressure, and with any steam pressure or superheat. When operating under any of these conditions, with wide variations of load, steam consumption is exceptionally low. The movement of a simple hand lever

NORDBERG



MACHINERY

TRADE-MARK

adjusts the compression, without affecting the clearance, to meet any steam pressure and degree of exhaust pressure. The change may be made while the engine is operating.

Nordberg compound Corliss and compound poppet engines are used when the power required is constant and the lowest possible steam consumption is desired.

Metal Mine Hoists

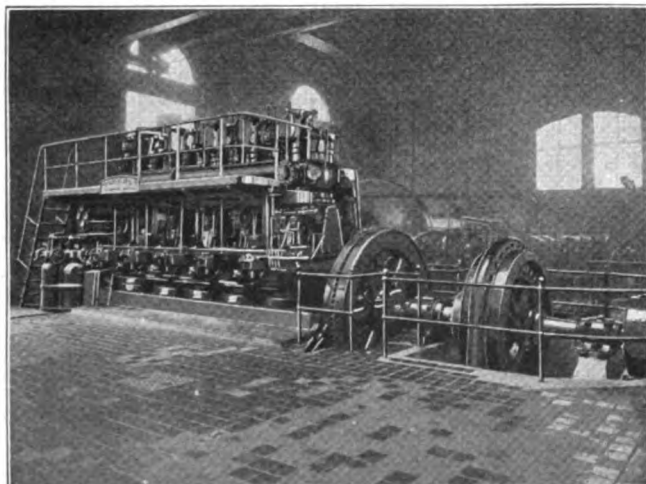
Steam Driven—When the depth is from 1000 to 14,000 ft., Nordberg mine hoists are specially designed to meet the conditions. The motive power may be simple Corliss or compound condensing Corliss engine. Nordberg hydraulically-operated post brakes and axial plate clutches, and Nordberg safety stops are used. Cylindro-conical drums are specified when their use is advantageous. Safety is the first consideration of Nordberg engineers.

Electrically Driven—Nordberg electrically driven metal mine hoists are equipped with drums 4 ft. or larger in diameter and have motors of 100 h.p. capacity or more. They comprise the direct coupled, the single reduction gear, and in special cases the double reduction gear types. Post brakes, axial plate clutches, hydraulically-operated devices and Nordberg safety stops are distinctive features.

Coal Mine Hoists

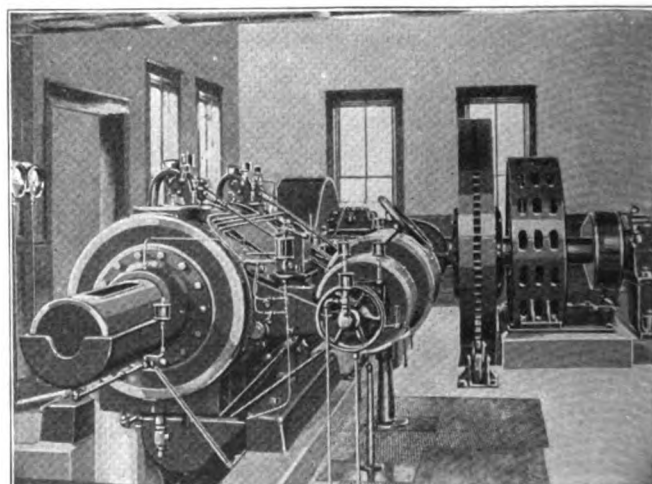
For coal mines where depth is not excessive and rapid hoisting is desired, Nordberg coal mine hoists will be found especially well adapted and economical. They are equipped with oil-operated post brakes and either cylindrical or cylindro-conical drums in accordance with the service demanded. An effective safety stop which will safeguard the hoists under all operating conditions is also furnished. Sizes range from 100 h.p. with drums of 4-ft. diameter up to the largest.

All post brakes are so designed that the posts move with parallel motion when engaging and releasing. The parallel motion prevents the brake blocks from dragging on the brake ring when the hoist is in operation and insures a perfect contact and equal pressure on all parts

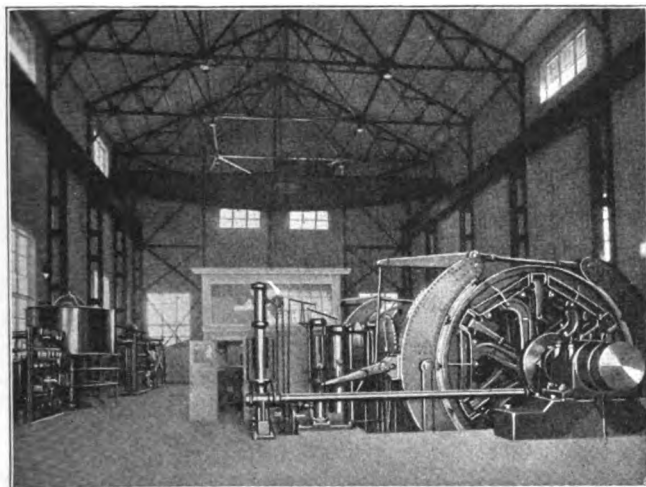


550 H. P. NORDBERG DIESEL ENGINE, DIRECT CONNECTED TO A 450 KV-A. GENERATOR

Engine is in continuous operation on a lighting load in the city of Yorkton, Saskatchewan, Canada



2300-VOLT, 3-PHASE, 60-CYCLE GENERATOR, DIRECT CONNECTED TO A NORDBERG-TODD UNIFLOW POPPET VALVE ENGINE
Used in the street lighting system of Marshalltown, Iowa



THE LARGEST FIRST MOTION HOIST IN THIS COUNTRY, BUILT BY NORDBERG FOR THE BUTTE & SUPERIOR MINING CO., DRIVEN BY AN 1800 H. P. MOTOR

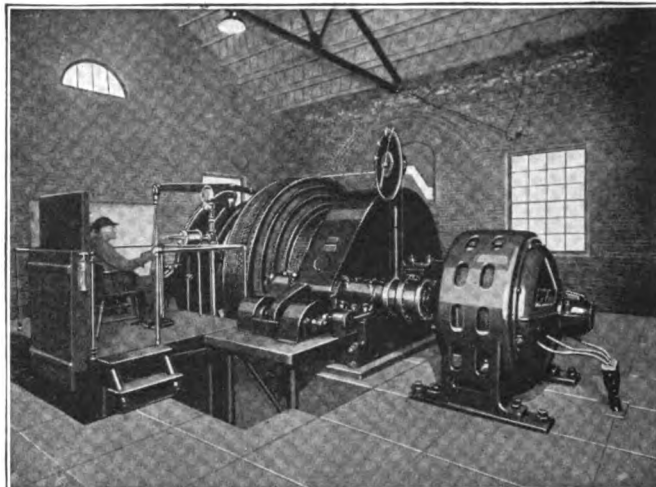
The hoisting depth can be increased by using larger drums and two 1800 h.p. motors

of the brake blocks. Hence even wear and maximum effective life of the blocks are secured.

The Nordberg axial plate-type clutch as used on Nordberg hoists is the only type of friction clutch that has equal driving power in both directions of rotation. Gripping of clutch is accomplished without producing any end thrust on drum shaft or drum. The specially designed features, on the brake and clutch operating cylinders, for controlling oil, combined with the floating lever control between the platform and operating valve, make the operation of the brakes and clutches as perfect as if operated directly by hand. Moreover, the parts may be moved with only a few pounds exerted on the operating levers.

Air Compressors and Blowing Engines

Nordberg air compressors and blowing engines are built in the larger sizes only, the air compressor having capacities of 1000 cu. ft. per minute and larger and the blowing engines 6000 cu. ft. per minute or more. They are arranged for motor, steam or oil engine drive. Owing to the demand for higher speeds, Nordberg air compressors are equipped with automatic valves in place of Corliss valves operated by Nordberg wrist plates and eccentrics. Nordberg automatic valves consist of thin strips of steel seated on cast iron seats. The cast iron seats, carrying the valves, guides and guards, are built in the form of a cylinder which fits into the same set of parts formerly used for the Corliss valves. This form of



NORDBERG COAL HOIST AT THE ONTARIO GAS COAL CO. MINE
The cylindro-conical drum distributes the acceleration and retardation loads, provides a more uniform torque and permits more rapid hoisting

construction makes it possible to convert any of the older types of Nordberg air compressors into the most modern compressors on the market, simply by dispensing with the valve gear and Corliss valves and substituting Nordberg automatic valves. Air compressors of the two-stage type, equipped with Nordberg automatic valves and when motor driven, are automatically unloaded by an air governor which maintains constant discharge pressure.

Condensers

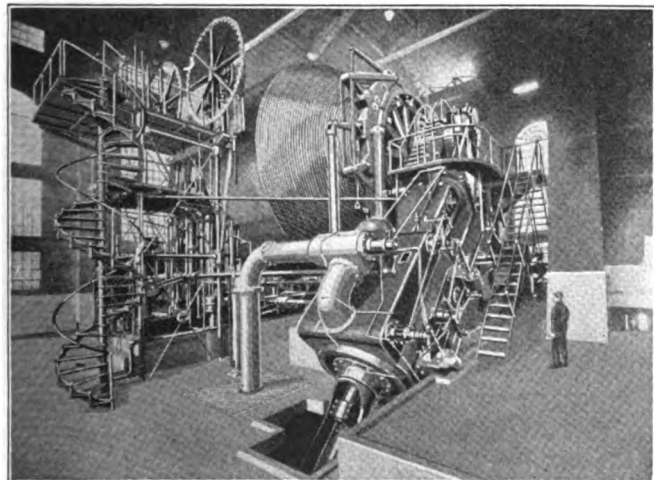
Nordberg condensers comprise jet condensers, either steam or power driven; surface condensers, with either steam or power operated air pumps; and where the quantity of steam to be condensed is large, counter-current jet condensers with Corliss engine-operated air and circulating pumps are recommended.

Gas Compressors and Vacuum Engines

The complete line of Nordberg gas compressors includes those for compressing carbon dioxide gas, natural gas and artificial gas, as well as special high pressure oxygen compressors. They are designed especially to meet the requirements of each particular installation. Nordberg vacuum engines produce a vacuum within a fraction of an inch of absolute.

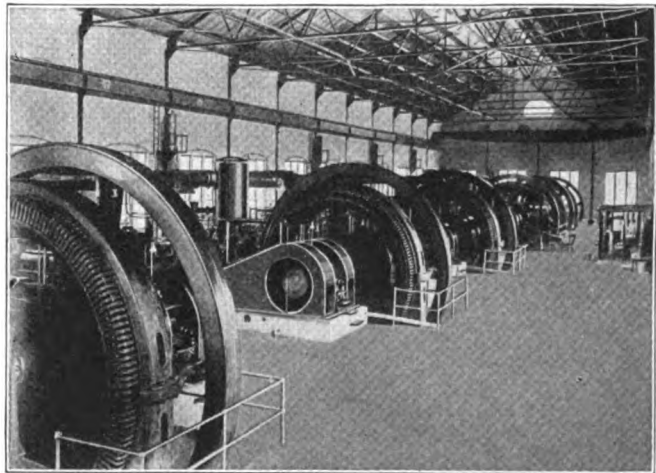
Nordberg Service

Nordberg's corps of highly trained engineers will gladly assist in the solution of engineering problems involving the use of any of the above mentioned apparatus. State the conditions to Nordberg.



THE LARGEST HOIST IN THE WORLD, BUILT BY NORDBERG FOR THE NO. 2 SHAFT OF THE QUINCY MINING COMPANY
It lifts 20,000 lbs. of ore from a vertical depth of 8600 ft. at 3200 ft. per minute

SWEET'S CATALOGUE



EIGHT NORDBERG TWO-STAGE AIR COMPRESSORS DRIVEN BY WESTINGHOUSE MOTORS AT THE ANACONDA COPPER MINING CO., BUTTE, MONT.

One of the largest compressor stations in this country

DODGE SALES AND ENGINEERING COMPANY

Manufacturers of Oil Engines

MISHAWAKA, IND.

For list of Engineering and Sales Offices, see page 702

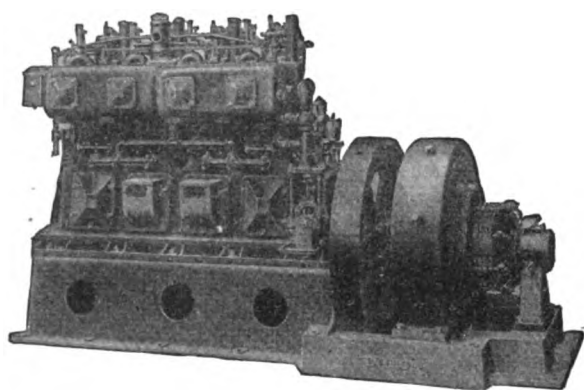
Products

DODGE HEAVY OIL ENGINES.

For Power Transmission Machinery, see pages 702-703.

Dodge Heavy Oil Engines

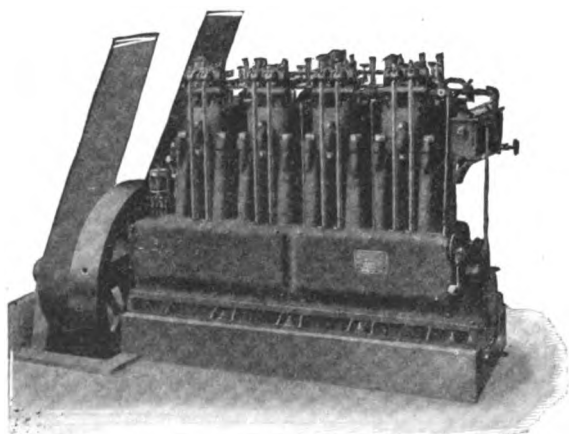
Dodge heavy oil engines use low grade fuel oils economically and successfully. They start and run on the same fuel.



50 H.P. DODGE HEAVY OIL ENGINE DIRECT CONNECTED TO 30 Kw. GENERATOR

In the Dodge engine combustion is accomplished by compression only. There are no ignition devices used, such as hot bulb or ball, electric torches, etc. Absence of delicate electrical attachments and other complicated parts adapts these engines for heavy duty commercial work as they are unusually economical in fuel consumption, require little attendance and can be depended on for long continuous runs.

This engine is of the entirely enclosed type. All auxiliaries are built integral with the engine.



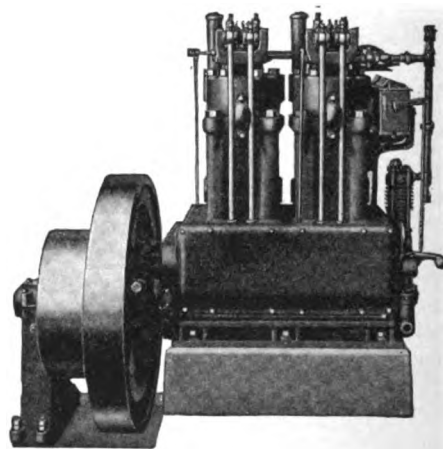
50 H.P. DODGE HEAVY OIL ENGINE FOR BELT DRIVE

Interchangeability is developed in the Dodge engine to a high degree. Cylinder parts and valves in all cylinders are identical. The one-cylinder 12½ h.p. engine differs only from the six-cylinder 75 h.p. size in length of base, camshaft and crank shaft.

A positively driven mechanically operated force feed multiple oiler supplies all cylinders, main bearings and connecting rods. Crank pins are lubricated from the force feed lubricator by the use of oil rings. The oil feed to bearings can be easily and accurately adjusted.

The cylinders of this engine are individual castings of arched construction extending from base to cylinder head and are interchangeable. Three oil leads from oil manifold provide for lubricating piston and cylinder. The cylinder head is designed to afford ample room for cooling water between the valves and especially around the exhaust valves.

Actual performance and comparative tests have proven the high efficiency, unusual fuel economy and low upkeep of Dodge heavy oil engines.



25 H.P. DODGE HEAVY OIL ENGINE FOR BELT DRIVE

STATIONARY ENGINE SPECIFICATIONS

Size B. h. p.	Number of cylinders	R.p.m.	Net weight, lbs.	Approximate weights and measurements, boxed for export	
				Gross weight, lbs.	Cubic mea- sure- ments, cu. ft.
12½	1	425	3000	4475	147
25	2	425	4000	5625	170
37½	3	425	5100	7100	206
50	4	425	6500	8600	230
75	6	425	8400	10875	275

THE MAXIM SILENCER COMPANY

83 Homestead Avenue
HARTFORD, CONN.

Product

MAXIM SILENCER.

Maxim Silencers Reduce Noise

Maxim Silencers reduce the noise of exhausts, intakes or discharges to a point below anything possible where ordinary mufflers are employed.

Maxim Silencers have been in use for the past 8 years. They are producing results that can not be accomplished with any other device, and have permitted the use of 2-cycle engines of 250 h.p. in residential districts.

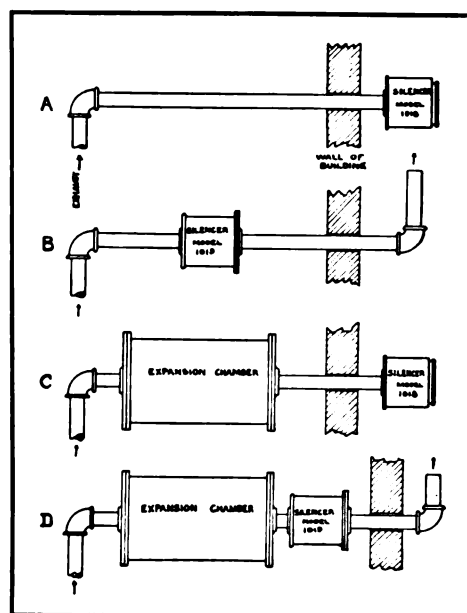
Where Maxim Silencers Can Be Used

The Maxim Silencer is suitable for stationary and marine service for silencing noisy

Gas and oil engines Air compressors
Steam engines Air hoists
Compressed air unloaders Steam traps
Blow-offs Steam safety valves

All forms of noisy steam, air or gas discharges.

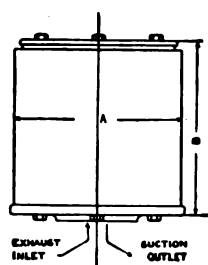
Maxim Silencers are made in the sizes listed in the



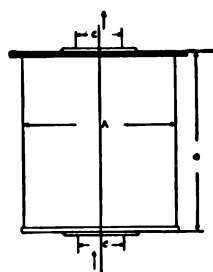
MAXIM SILENCER CONNECTIONS



MAXIM SILENCER



Model 1018



Model 1019

accompanying table. The larger sizes are used on large steam and air discharges. Intermediate sizes are used on air compressor intakes and oil engine intakes and exhausts. Smaller sizes ($\frac{1}{2}$, $\frac{3}{4}$ and 1 in.) are used on pneumatically controlled devices with a noisy discharge; air hoists; various forms of steam discharges which make a disagreeable hissing noise, and on farm engine exhausts.

Model 1018 is installed at the end of the exhaust or intake, or on both, as illustrated. If impractical to install the Silencer at the end of the pipe, Model 1019 should be used and installed as illustrated.

For extremely sensitive engines, any convenient expansion chamber should be installed, the recommended dimensions of which are given in accompanying table.

Where a noisy muffler system is already installed, Model 1018 Maxim Silencer may be attached to the end of the exhaust pipe and the troublesome noise reduced.

Compact and Staunchly Constructed

The Maxim Silencer is less than one-half the size of the ordinary muffler and correspondingly lighter in weight. It is rugged in construction and built for long, severe service.

Furnished either in sheet steel or cast iron, the silencing chambers being coated so as to be immune to the corrosive action of certain gases and vapors exhausted, as in the case of oil engines using a fuel high in sulphur.

The silencing of noise is accomplished by reflecting the sound waves and damping them by many reflections. The passage of the gases or vapors is not subject to severe eddy losses, thus back pressure is low and the most sensitive engines can be equipped to operate properly, efficiently and quietly.

DIMENSIONS OF MAXIM SILENCERS

	Model No. 1018										**Model No. 1019									
*C, in.....	1	2	3	4	6	8	10	12	14	4	6	8	10	12						
A, in.....	8	10	13	16	23	30	33	40	46	16	21	27	33	40						
B, in.....	4	8	10	14	19	25	32	39	46	17	22	28	36	44						
Weight, lbs....	10	50	100	200	450	900	1200	1500	1700	150	375	700	1200	1500						
§Expansion chamber:																				
Length, in.....				48	60	72	84	96	108	120	60	72	84	96	108					
Diameter, in....				24	30	36	42	48	54	60	30	36	42	48	54					

*Pipe size.

§These are the recommended sizes for best results; however, any kind of expansion chamber available can be used; a large chamber will produce more satisfactory results than a small one.

**This model can be installed on pipes less than 4 in. by bushing down.

DE LAVAL STEAM TURBINE CO.

MAIN OFFICE AND WORKS
TRENTON, N. J.

SALES OFFICES

NEW YORK, N. Y.
PITTSBURGH, PA.
PHILADELPHIA, PA.
SAN FRANCISCO, CAL.
LOS ANGELES, CAL.

TORONTO, ONT.

CHICAGO, ILL.
CLEVELAND, OHIO
CHARLOTTE, N. C.
DULUTH, MINN.
KANSAS CITY, MO.

BOSTON, MASS.
INDIANAPOLIS, IND.
NEW ORLEANS, LA.
ATLANTA, GA.
SALT LAKE CITY, UTAH

BIRMINGHAM, ALA.
DENVER, COLO.
SEATTLE, WASH.
DALLAS, TEX.
VANCOUVER, B. C.
MONTREAL, QUE.

Products

STEAM TURBINES; CENTRIFUGAL PUMPS; BLOWERS and COMPRESSORS; SPEED REDUCING GEARS.

Also manufacturers of Special Centrifugal Machinery.

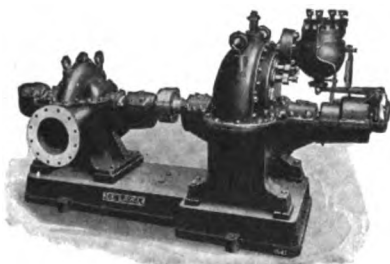
Steam Turbines

In the production of steam turbines, we offer the combined advantages of standardized design and quantity production, combined with a sufficient selection of types to suit each user's requirements.

De Laval turbines are built for all steam conditions, such as high pressure, condensing and non-condensing, back pressure, bleeder and mixed flow service. They are also adapted to driving machines at all speeds, either directly connected or through the De Laval double helical speed reducing gear.

The De Laval velocity stage turbine has been designed to operate on high pressure, high temperature steam. The steam chest and governor valve, which are the only parts with which the steam comes in contact,

are made of steel and so located that heat is not readily conducted to the bearings. De Laval velocity stage turbines are made in all sizes up to 1200 h.p. The hand controlled valves for cutting out nozzles permit of high efficiency under varying



DE LAVAL VELOCITY STAGE TURBINE
DRIVING CENTRIFUGAL PUMP

loads and steam conditions

De Laval pressure stage turbines, built in capacities up to 15,000 h.p., give the highest obtainable efficiencies. Turbines of this type connected to De Laval double helical gears and driving standard direct current generators, excel in economy large turbo alternators when transformer and converter losses are included. Large geared turbine driven centrifugal pumps rival triple expansion pumping engines in duty.



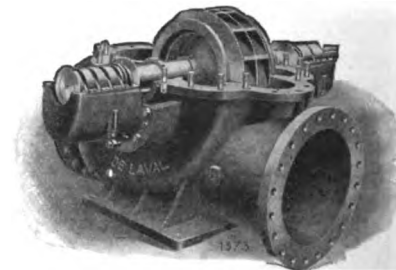
ONE OF THREE DE LAVAL GEARED TURBINE DRIVEN CENTRIFUGAL PUMPS.
FOR THE CITY OF CHICAGO
60,000,000 gals. per day each against
150-ft. head

Centrifugal Pumps

De Laval centrifugal pumps are characterized by conservative speeds, high class materials, construction on a limit-gage interchangeable basis, guaranteed efficiency

and capacity, and a comprehensive system of testing by which the fulfillment of these guarantees is demonstrated.

The low starting torque and high efficiency of De Laval centrifugal pumps are of great value where pumps are to be driven by electric motors, as is also the self-limiting power characteristic. De Laval pumps can be driven by self-starting synchronous motors.



DE LAVAL SINGLE STAGE PUMP WITH
CASING COVER REMOVED

The casing is split horizontally, the suction and discharge connections and the bearing supports being included in the lower part.

The De Laval *labyrinth wearing ring* assists materially in maintaining the original efficiency, as it does not require small clearance in order to prevent excessive leakage.

Finished repair parts are supplied, made to accurate dimensions so that they can be put in a pump without requiring to be fitted.

Centrifugal Blowers and Compressors

De Laval centrifugal blowers and compressors are built for all pressures up to 120 lbs. per sq. in. With electric motor driven compressors for high pressures, efficiency and economy are improved by the use of speed increasing gears.



DE LAVAL TURBINE DRIVEN GAS
BOOSTER



DE LAVAL TURBINE DRIVEN MULTI-STAGE COMPRESSOR

14,650 cu. ft. of gas from 10-in. water column vacuum to 8-lb. gage pressure

Speed Reducing Gears

De Laval speed reducing gears are of the double helical type and the result of over 25 years' experience in building reduction gears for steam turbine service. The cutting methods employed are such that the correct pitch, angle and tooth contour are produced, and quiet running and long life are secured.

Guarantee, etc.

All De Laval apparatus is built on a limit-gage, interchangeable basis. The performance of every machine is guaranteed, both as to capacity and efficiency, and a complete test is carried out before shipment. Engineering suggestions and special publications will be sent on receipt of letter describing the conditions.

KERR TURBINE COMPANY

WELLSVILLE, N. Y.

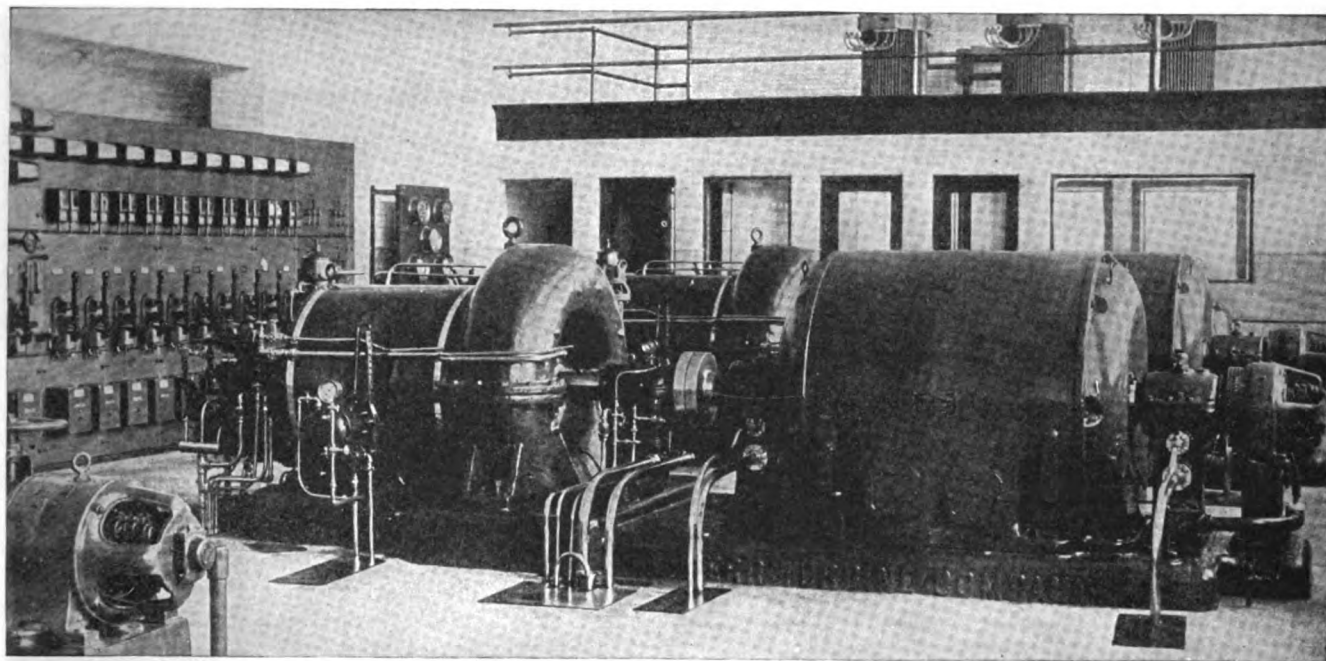
Products

STEAM TURBINES.
REDUCTION GEARS.

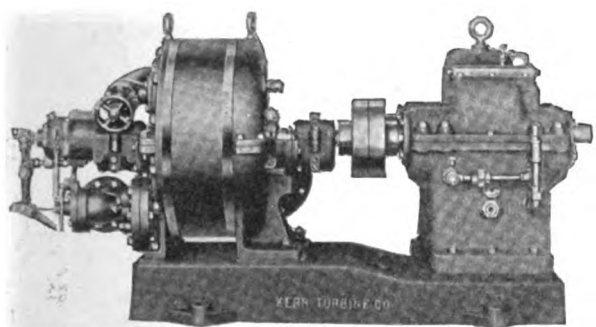
KERR
TRADE-MARK

Kerr Turbines

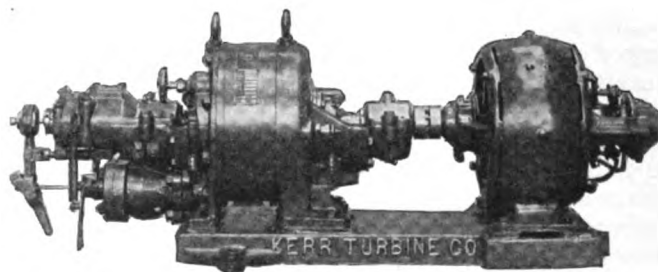
Built in capacities of from 1 to
5000 h. p.



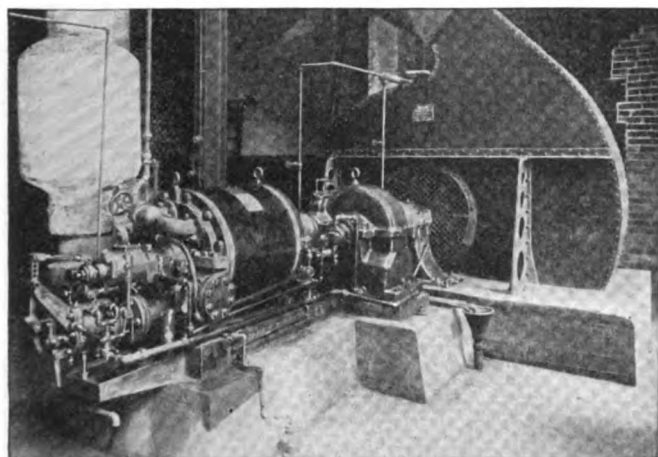
TWO 750 Kw. BLEEDER TYPE KERR TURBO-ALTERNATORS AND EXCITERS



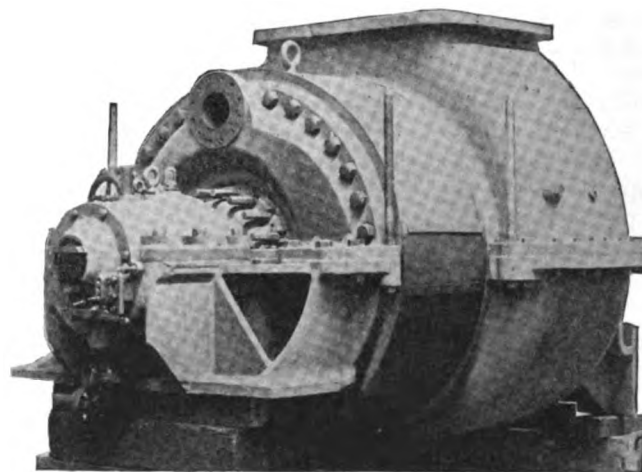
100-300 H.P. KERR NON-CONDENSING TURBINE AND GEAR



10 Kw. KERR LIGHTING SET



300 H.P. HIGH PRESSURE NON-CONDENSING KERR TURBO BLOWER



1000-4000 H.P. MARINE TYPE KERR TURBINE FOR SHIP PROPULSION

THE TERRY STEAM TURBINE CO.

HARTFORD, CONN.

DISTRICT OFFICES

ATLANTA, GA., 1521 Candler Building
 BIRMINGHAM, ALA., 420 South 20th Street
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 HARTFORD, CONN., J-B ENGINEERING SALES Co., P. O. Box 479
 HOUSTON, TEX., A. M. LOCKETT & Co., 423 Southern Pacific Building
 KANSAS CITY, MO., BEESON MACHINERY Co., 308 Mutual Building
 HAVANA, CUBA, ZALDO, MARTINEZ & Co., 26 O'Reilly Street
 MONTREAL, QUE., FRASER & CHALMERS OF CANADA, LIMITED, Guarantee Building, Beaver Hall Hill

LOS ANGELES, CAL., 406 American Bank Building
 NEW YORK, N. Y., 95 Liberty Street and 90 West Street
 MEMPHIS, TENN., McBEZ ENGINE & IMPLEMENT Co., 338-48 Piomingo Street
 MINNEAPOLIS, MINN., L. E. POLLARD Co., 423 Fifth Street, South
 NEW ORLEANS, LA., A. M. LOCKETT & Co., 521-25 Baronne Street
 PHILADELPHIA, PA., 302 Maxwell Building, 16th and Walnut Streets
 PITTSBURGH, PA., 816 Oliver Building
 RICHMOND, VA., 301-302 American National Bank Building
 SAN FRANCISCO, CAL., 1070 Folsom Street
 SEATTLE, WASH., FRYER-BARKER Co., 1133 Henry Building
 ST. LOUIS, MO., 1105 Chemical Building
 VANCOUVER, B. C., FRYER-BARKER Co., 707 Standard Bank Building

ERITH, KENT, ENGLAND, FRASER & CHALMERS ENGINEERING WORKS

Products

STEAM TURBINES, Condensing and Non-condensing.
 CENTRIFUGAL TURBO-PUMP SETS for all classes of service.

TURBO-GENERATOR SETS, D. C. or A. C., direct connected or through Terry Reduction Gears.

TURBO-BLOWERS for forced or induced draft.

REDUCTION GEARS; combined TURBO-GEAR UNITS.

Capacities of Terry Turbines

Horizontal Terry turbines are built in sizes up to 1500 h.p., combined gear units in sizes up to 125 h.p., while the vertical types cover a range from 1 to 600 h.p.

Terry Non-condensing Turbines

Principle of Operation—The outstanding feature which makes the Terry turbine so simple and reliable is its principle of operation.

It is of the compound velocity stage impulse type, i. e., the steam is expanded to desired point in a correctly formed jet or nozzle, wherein its pressure energy is converted into kinetic or velocity energy.

Steam is distributed by a steam chest or steam ring to a series of nozzles. In these nozzles the steam is expanded from approximately boiler pressure to exhaust pressure.

Issuing from the nozzle at high velocity, the steam enters the side of the wheel bucket in which its direction is reversed 180°.

As the initial impact absorbs only a part of the total energy, the jet of steam passes into a reversing chamber which returns it to the wheel bucket. This action is repeated several times until all of the available energy is exhausted.

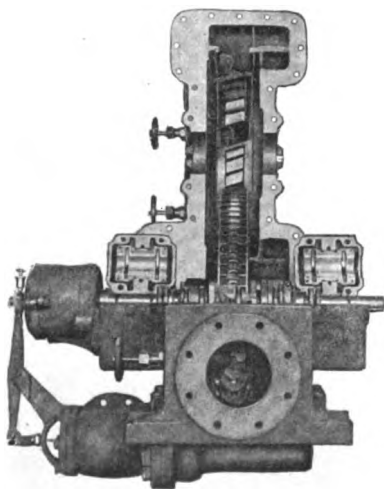


FIG. 1. NON-CONDENSING TERRY TURBINE WITH COVERS LIFTED

Split case, short shaft span, large interchangeable bearings and maximum accessibility. Low temperature and constant alignment. *Indestructible wheel*

A distinct advantage of the Terry principle of operation is that the highest economies are obtained at lower speeds.

Features of Design—Accessibility—The Terry turbine may be completely dismantled, including removal of rotor without disturbing the alignment or the steam and exhaust piping.

This is accomplished by splitting the casing on the shaft center line including bearings and glands, and locating steam and exhaust connections in the lower half.

Simplicity, Safety and Reliability—The Terry turbine is built with a totally enclosed one-piece wheel with uniform rotary motion.

This indestructible wheel is made of special composition steel with semicircular buckets milled from the solid metal (Fig. 4).

The bladelike portion between these buckets receives no power-producing action from the steam, but merely serves to split the jet.

The power-producing action of the steam takes place entirely on the curved surface at the back of the bucket (Fig. 2), therefore erosion does not alter the angle at which the steam enters or leaves the bucket.

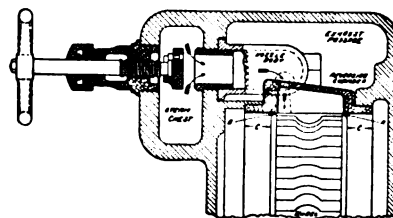


FIG. 3. DIAGRAM SHOWING WHEEL CLEARANCES

AA—rim clearance. B—large blade clearance. CC—side clearance (about 1 in.). Blades can not foul, as they are protected by rims. Rubbing at AA will do no damage. Side clearance is so large that end play from excessive external thrust can not damage wheel



FIG. 2. ACTION OF STEAM IN TERRY TURBINE

Action is such that steam is returned to the wheel again and again until all available energy is utilized. Power producing action of steam takes place on back of buckets, so that erosion of blade edges has little effect on economy or power



FIG. 4. INDESTRUCTIBLE WHEEL OF TERRY TURBINE

Buckets cut from the solid and protected from rubbing by raised wheel rim. Notch at center of blade reduces blade weight and stresses. Wheel can not burst and injure operators

This construction enables the Terry turbine to maintain its original efficiency after a great many years of service.

The fact that steam impinges against the wheel in a direction perpendicular to the axis makes it unnecessary to provide for end thrust.

The large wheel clearances are shown in Fig. 3. It is impossible for wheel buckets and reversing chamber buckets to foul. The blades of the wheel are protected by projecting rims (Figs. 3 and 4), which will take care of any rubbing that might occur if for any reason the radial clearance should become reduced.

Its rugged, simple construction makes it a fool-proof piece of apparatus that can be operated by engineers not familiar with turbine operation.

Centrifugal Turbo-pump Sets

Terry centrifugal turbo-pump sets are adapted for all classes of service, including boiler feed, condenser circulation, hot well, dredging, fire service, vacuum, water works and general service.

The advantages embodied in these pump sets are reliable operation, high efficiency, low maintenance charges and absence of waterhammer, valves and rubbing reciprocating parts.

They may be automatically governed by pressure regulators. In this way the speed of the unit is automatically varied so as to maintain constant pressure in the discharge line regardless of the amount of water used.

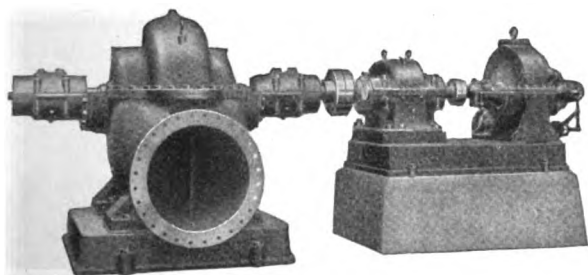


FIG. 5. TERRY CONDENSER CIRCULATING SET

Note the rugged appearance, compactness and simplicity. Where high efficiency is required, a Terry geared unit is used

Turbo-generator Sets

Turbo-generator sets furnished in sizes from 1 kw. to 750 kw., geared or direct connected, condensing or non-condensing. Used extensively for main units in small plants or auxiliary sets for night lighting, weekend service, marine work, lifting magnet sets, etc. In non-condensing work, the turbine may be designed to exhaust against most any back pressure desired for heating, manufacturing or other purposes.

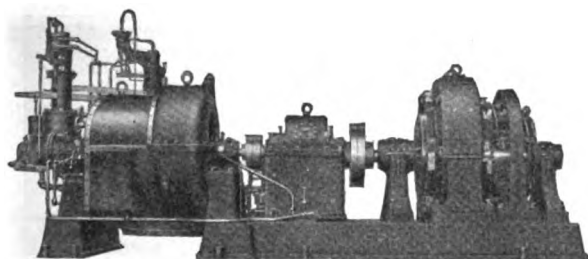


FIG. 6. TERRY TURBO-GENERATOR SET

Direct current units geared to permit high turbine speed and efficiency and low generator speed for good operating characteristics

Turbo-blower Sets for Forced and Induced Draft

Fan units are usually installed in objectionable locations, where they are subject to excessive heat and dirt. The Terry turbine, with its freedom from vibration, its ability to operate over long periods under adverse conditions without attention, is particularly adaptable to this service. Turbine drive also obviates the objectionable large fans necessary with engine drive, because of the low speed required by the engine for reliable service.

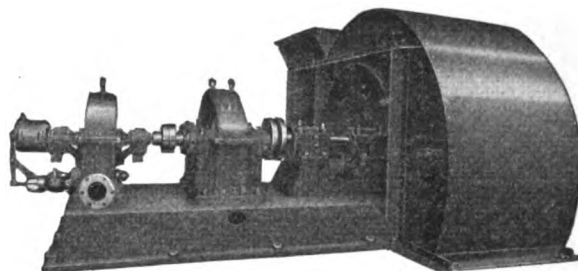


FIG. 7. TERRY INDUCED DRAFT FAN

Small space and light foundations make it readily adaptable to plant conditions. Its high speed avoids the necessity of large bulky fans

Reduction Gears

Terry gears and pinions are of the stub-tooth double helical type, cut by the most accurate method and are interchangeable. The lubricating system is unusual in the ample supply of cool oil under pressure to the bearings.

All Terry gears have forced feed lubrication, ring oiling not having been found satisfactory.

Cooling is effected by large water chambers, cored in the walls of the gear case, eliminating risk of leakage where pipe cooling coils are used.

Bearings are split horizontally to permit their replacement without removing the couplings.

Gears furnished for either direction of rotation, the only change being the location of the oil spray piping above or below the contact point.

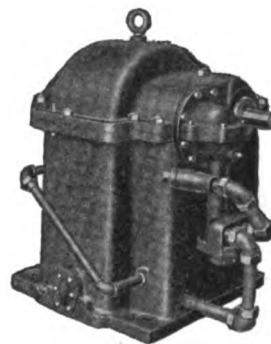


FIG. 8. TERRY REDUCTION GEAR

Note horizontally split casings, giving complete accessibility

Combined Turbo-gear Units

In sizes up to 125 h.p., geared turbine units may be obtained in one common rigid frame casing.

Each part of the unit possesses the same features of design contained in the separate turbine and gear.

The advantages embodied in this type of unit are: decreased cost, light weight, compactness, maintained correct alignment and no flexible coupling. Both turbine and gear are horizontally split to permit easy access to interior for inspection or repairs.

E. B. BADGER & SONS CO.

Spray Water Cooling Systems, Air Washers and Multiple Strainers
BOSTON, MASS.

NEW YORK OFFICE, 101 Park Avenue

CHICAGO OFFICE, 352 East 22nd Street

Products

WATER COOLING SYSTEMS; SPRAY PONDS; AIR WASHERS; MULTIPLE STRAINERS.

Also manufacturers of Air Conditioning Apparatus; Air Coolers; Smoke Washers; Odor Condensers; Gas Scrubbers; Humidifiers; Spray, Sewage and Aerating Nozzles; Spray Equipment for acid plants.

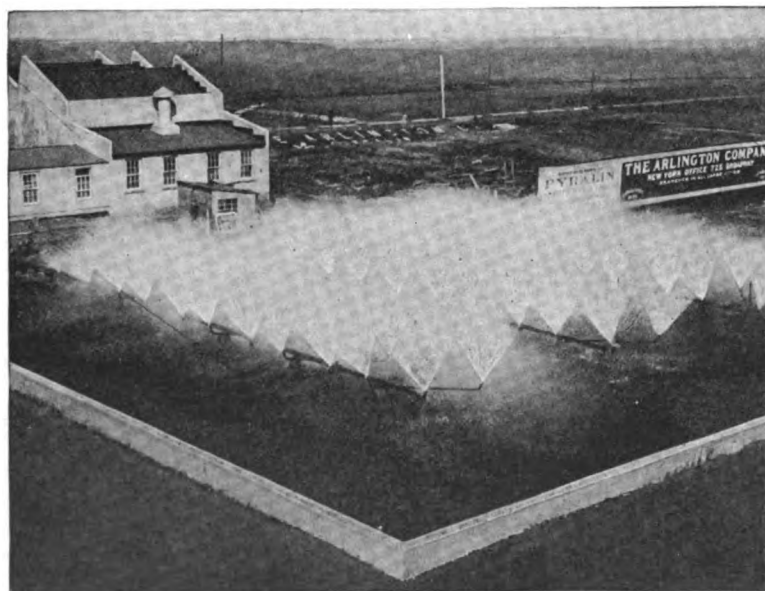
For Expansion Joints, see page 572.

Water Cooling Systems

Adapted to cooling condensing water for steam power plants, refrigeration systems, evaporators, etc., for re-use; are especially useful where water is scarce. When cooling water for steam power plants they are guaranteed to cool the water sufficiently to afford an average vacuum better than 28 in. based on modern condensing equipment and good operating conditions. Systems can be operated at 6 lbs. pressure, to cool to or below atmospheric temperature.

Nozzle—As a result of extensive experience with spray plants, this company has developed a nozzle scientifically designed for spraying large volumes of water at low pressures with highest efficiency. Each spray nozzle is fitted with the improved turbine center. The design of this center is such that a rapid rotating motion is imparted to liquid passing through it, producing a strong centrifugal action and causing liquid to break up into fine spray as it leaves nozzle.

At 5 lbs. pressure spray issues in the form of an inverted solid cone composed of particles that, while fine, will settle within the spray pond limit; at 7 lbs. pressure, liquid is broken up into a mist producing the greatest cooling possible at low pressures. Large opening through center and short, free water passageways—former prevents clogging, latter increases cooling efficiency of the nozzle as well as its capacity. The inside of shell and vanes is finished smooth, and all water passages are made as large as possible to reduce friction loss of water passing through nozzle.

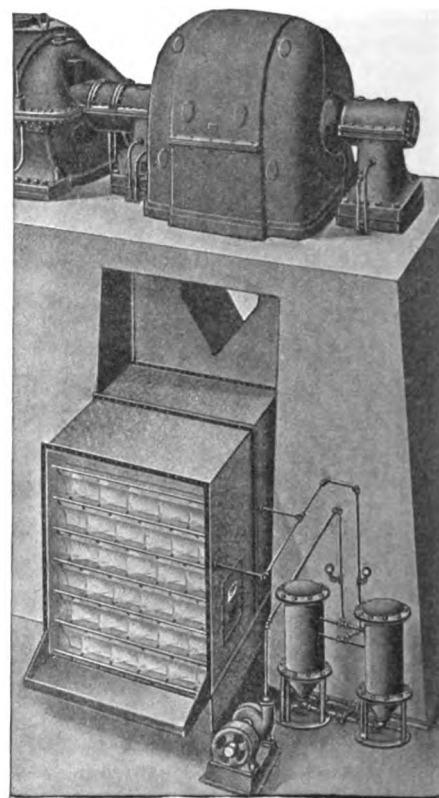


COOLING POND

There are no moving parts to wear out, all parts of the nozzle being stationary and only water rotating. Liability to clog is reduced to a minimum by providing a large waterway through nozzle. Ordinarily made of high grade bronze but other metals can be used when necessary for spraying acids, alkalis, etc.

Air Washers

Adapted to cooling and cleaning air for ventilation of turbo-generators, transformers, and other electrical and mechanical equipment; wherever cool, clean air of even temperature and humidity is required for successful operation of processes. These washers cool air to its wet bulb temperature, removing 98% of suspended dust. They are applicable to the recently developed closed system of turbo-generator ventilation whereby the air is recirculated, thus eliminating all introduction of dirt into the generator with the air. Compact in design, they require little space.



AIR WASHER

Multiple Strainers

Efficiency of spraying for most processes depends on fineness of spray, which is made possible only by an efficient straining device. The company's multiple strainers have incorporated in them the latest developments in strainer construction, permitting ease of cleaning, reversal of flow, removal of solid matter without stopping operation, and are designed to prevent clogging due to electrolytic action. This high development makes possible the use of sprays where it would otherwise be impracticable.

These multiple strainers are well adapted to general plant service and for use in boiler feed suction lines, jacket and bearing water lines, oil cooler lines, etc., where thorough removal of sediment and fine particles from the water is demanded.

RODNEY HUNT MACHINE CO.

Turbine Water Wheels and Water Controlling Apparatus

90 River Street
ORANGE, MASS.

Products

TURBINE WATER WHEELS; STEEL FLUMES; STEEL and WOOD PENSTOCKS; WOOD and METAL GATES for Flumes and Sluiceways; GATE HOISTS of all types.

Also Small Power Water Wheels; Wood Rolls and Textile Wet Finishing Machinery.

McCormick and Francis Turbine Water Wheels

Vertical Types—We supply different types perfected to satisfactorily meet the needs of connecting present mill shafting or to direct connection to vertical type generators.

Horizontal Types—This setting of turbines is adaptable to a wide range of conditions by installing one or more runners on the same shaft. These commercial installations are excellent either for connection to generators or to mill shafting.

Steel Flumes

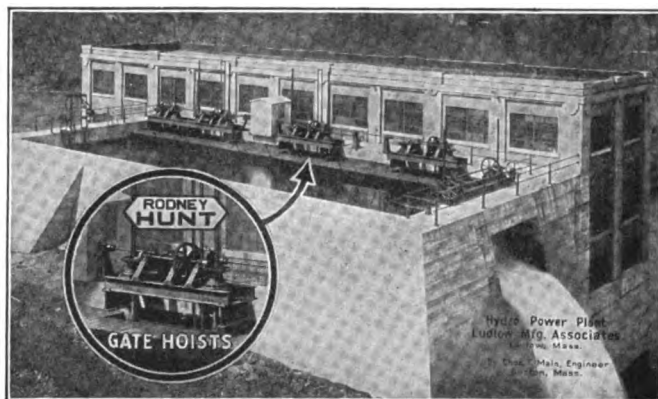
Flumes with steel plates and cast iron heads are designed and manufactured for low and high heads. Excellent manufacturing equipment enables us to supply these of most permanent construction.

Gates for Flumes and Sluiceways

Supplied in a wide variety of designs in either wood or cast iron to meet requirements over a very wide range.

Penstocks

Both wood and steel penstocks are manufactured according to latest designs to satisfy pressure conditions up to 100 ft. head of water.



"RODNEY HUNT" TIMBER GATES, 14x14 FT. AND 11x18 FT., COMPLETE WITH SCREW TYPE HOISTS FOR LUDLOW MFG. ASSOCIATES, LUDLOW, MASS.
CHAS. T. MAIN, Engineer, Boston, Mass.

Gate Hoists

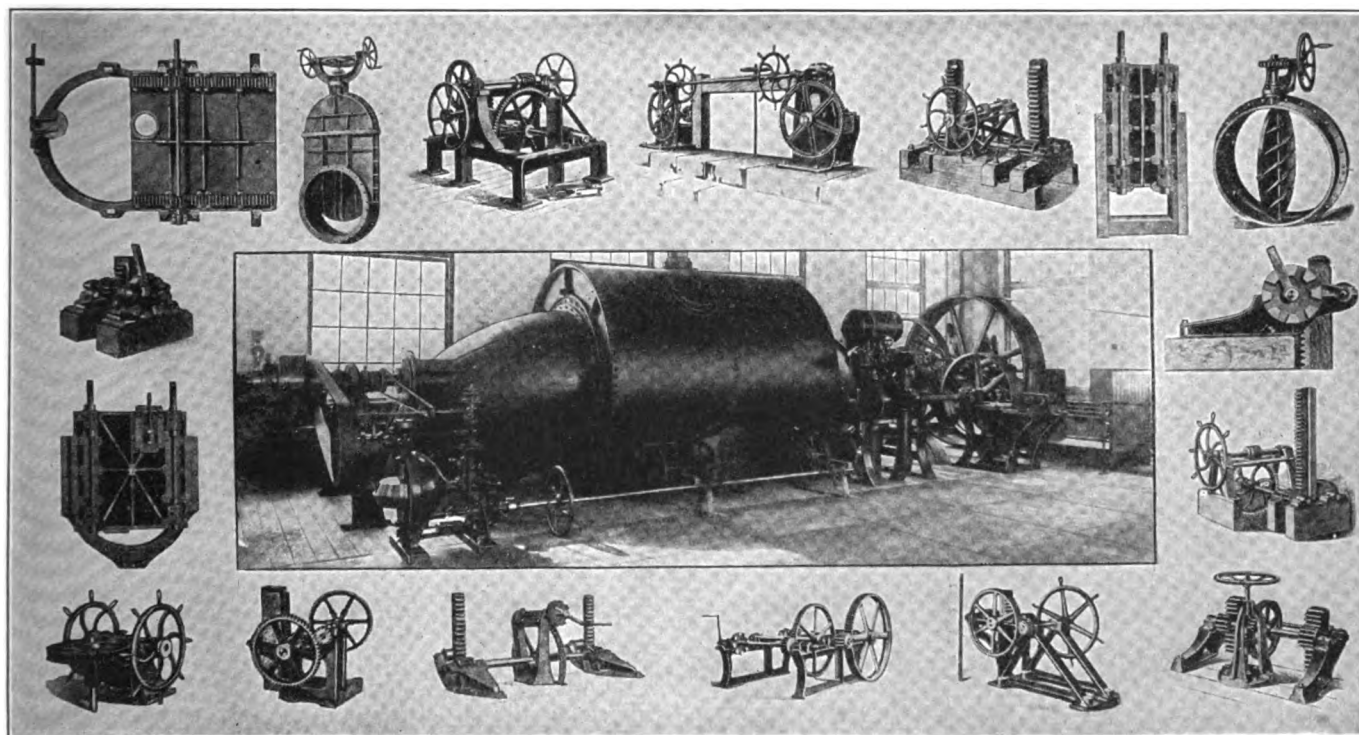
A complete line of gate hoists for either motor or hand operation. Representative styles are illustrated below. Our designs are of such variety as to meet the requirements of practically every kind of gate.

Characteristics of Rodney Hunt Apparatus

Established durability, efficiency, reliability, ease of operation and low cost of maintenance.

"Small Power" Information Book

Fully illustrated with many tables. Price, \$3.50.



WATER POWER EQUIPMENT—"FROM DAM TO TAILRACE"

ALLIS-CHALMERS MANUFACTURING COMPANY

Complete Centrifugal Pumping Units

MILWAUKEE, WIS.

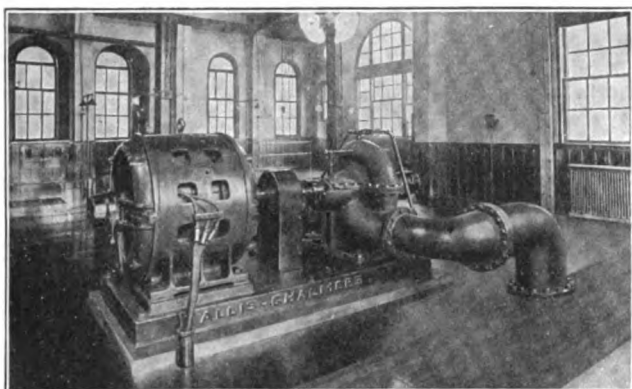
For other Products and District Offices, see page 724.

Products

Specialists in the selection, design and manufacture of the following:

CENTRIFUGAL PUMPS and CENTRIFUGAL PUMPING UNITS for every service: Mill and Factory Water Supply Pumps, City Service Pumps, High Pressure Fire Pumps, Underwriters' Fire Pumps, Drainage Pumps, Sewage Pumps, Boiler Feed Pumps, Condenser Pumps, Hot Well Pumps, Heating System Pumps, Filter Pumps, Sugarhouse Pumps, Paper Mill Pumps, Mine Pumps, Irrigation Pumps and Pumps for Special Service.

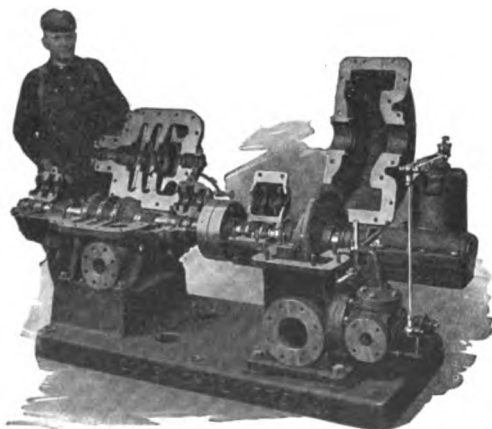
For Power and Electrical Equipment, see pages 724-725.



12-IN. TYPE "S" MOTOR DRIVEN PUMP INSTALLED FOR CITY OF ELMIRA, N. Y.

Service

Careful consideration of every customer's pumping problem, the selection of the most suitable pump and drive from our own complete lines of products, pumps of efficient design economically produced and ready for quick delivery, a careful shop test before shipment, all go to make up a service which insures the buyer pump satisfaction.



MULTISTAGE BOILER FEED PUMP, TURBINE DRIVE



TRADE-MARK

Combined Units

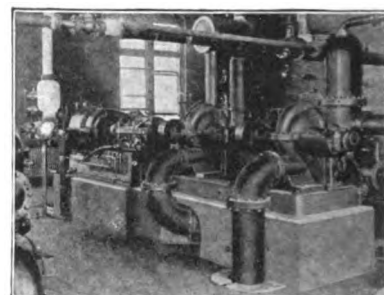
The ALLIS-CHALMERS MANUFACTURING COMPANY make a specialty of combined units consisting of pump and motive power of their own manufacture as the best way to give purchasers a complete unit with both pump and drive properly proportioned. The uniformly economical and reliable performance of our

"Complete units of undivided responsibility" has been impressive.

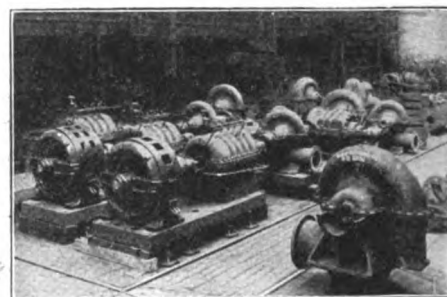
Types of Pumps

The types of pump manufactured as standards are: the single stage type "S," built in sizes from 1½-in. discharge to 24-in. discharge with capacities ranging from 30 g. p. m. to 20,000 g. p. m. and good for heads up to 200 ft. in the larger sizes; the multistage type

"ST" built in sizes ranging from 2½ to 14 in. and for normal heads up to 500 ft., although we are prepared to build special multistage pumps for considerably higher heads; special pumps in horizontal and vertical types up to the largest practical sizes, also underwriter fire pumps, rubber lined sand and slime pumps and modifications of standard pumps for special services. All strictly standard types of pumps are of the cast iron, bronze fitted, horizontal shaft, split casing type.



GEARED STEAM TURBINE DRIVEN MUNICIPAL PUMPING UNIT



PUMPS ON ERECTING FLOOR

Catalogue

Our centrifugal pump Bulletin 1632-EX, which we will send without charge on request, contains considerable useful information which will assist those contemplating the installation of centrifugal pumps.

AMERICAN STEAM PUMP COMPANY

BATTLE CREEK, MICH.

NEW YORK OFFICE, 17 Battery Place

CHICAGO OFFICE, 1220 Monadnock Block

Products

AMERICAN-MARSH VACUUM PUMPS; AMERICAN POWER PUMPS; AMERICAN-MARSH BOILER FEED PUMPS; AMERICAN-MARSH CENTRIFUGAL PUMPS; MARSH DEEP WELL ENGINES.

Also manufacturers of American Compound Pumps, Water Works Pumps, Elevator Pumps, Belt or Steam Driven Air Compressors; American-Marsh Steam Pumps, Automatic Boiler Feed Pumps and Receivers, Hydraulic Pressure Pumps, Tank Pumps, Magma Pumps, Oil Pumps, Brine Pumps, Sinking Pumps, Jet Condensers.

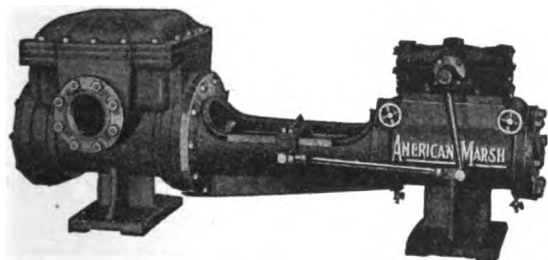
American-Marsh Pump

Of the improved Marsh design. Consists of all the advantages and governing element of the well-known Marsh pump combined with the American simple, positive and reliable auxiliary valve which is mechanically actuated by a lever arm connected to the crosshead attached to piston rod. With this combination the inside trip tube and packing box formerly used in the Marsh design are eliminated. The American-Marsh is the very best pump ever produced; it is positive in action, possessing a perfect governing element and will not hang up under all the varying conditions.

Made of the best material and rugged and substantial in design. Steam and water cylinders joined by heavy cast iron yokes with ring and plug fit to insure perfect alignment of wearing parts. Special bronze fittings (not common brass) furnished regularly without extra charge, consisting of removable bronze liners, bronze piston rods, valve seats, valve bolts, springs; also either good grade hard or soft rubber valves or bronze valves, as the service may require, are furnished.

Pumps for Heating Service

Due to the positive full stroke, self-governing element and special fitting, these pumps are particularly adapted for use in connection with heating systems of all descriptions. The American-Marsh is the very best pump made for extreme hot water service.

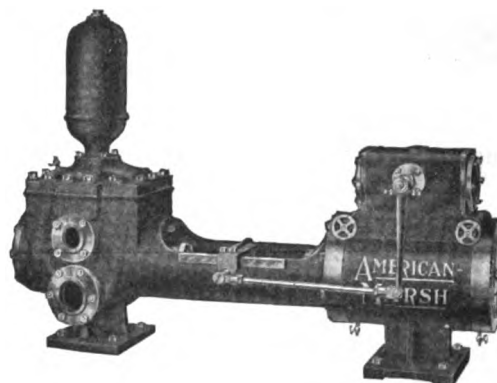


STYLE "S" AMERICAN-MARSH VACUUM PUMP
Side suction; double base; delivery opposite

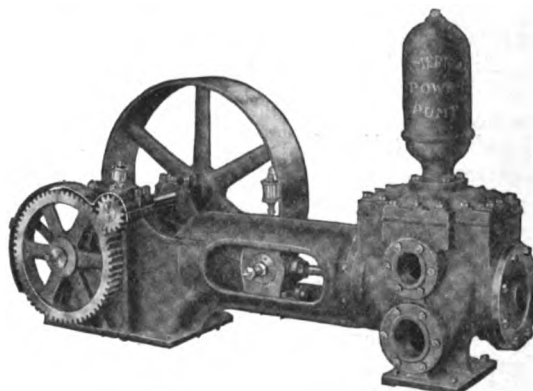
American-Marsh Boiler Feed Pump

Heavily constructed and bronze fitted; equipped with solid bronze piston rods, bronze valve seats, bolts and springs and heavy cast bronze removable water cylinder bushings, with the exception of the three smallest sizes, in which the bushing is pressed into place. Waterways large and direct, with ample valve area. Ample handholes, giving immediate access to all water valves, are furnished in the larger size piston pumps and in all outside center packed plunger pumps.

In cases where the boiler pressure exceeds 150 lbs., the outside center packed plunger type is recommended. Description and other data on application.



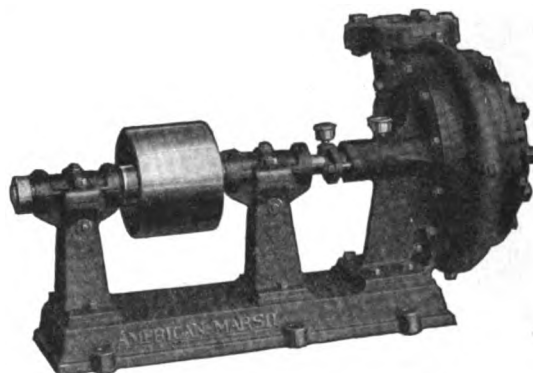
AMERICAN-MARSH BOILER FEED PUMP



AMERICAN GEARED POWER PUMP

American-Marsh Centrifugal Pump

Very simply constructed; hence first cost is much less than any other style of pump. No valve used in construction and practically noiseless in operation. Occupies but little space; cost of foundation is small.



TYPE "B" AMERICAN-MARSH CENTRIFUGAL PUMP

Marsh Deep Well Engine

Designed for pumping wells in which the water drops below suction reach of the regular horizontal pump. Steam head or steam cylinder is located at the surface of the ground, while the water cylinder is lowered to the water and operated by means of a well rod connecting the steam and water pistons.

THE AMERICAN WELL WORKS

Manufacturers of Centrifugal and Deep Well Plunger Pumps

GENERAL OFFICE AND WORKS

AURORA, ILL.

First National Bank Building

CHICAGO, ILL.

DISTRICT AND SALES AGENCIES IN UNITED STATES

NEW YORK, N. Y.
(Domestic and Export)
PHILADELPHIA, PA.

PITTSBURGH, PA.
ST. PAUL, MINN.
SAN FRANCISCO, CAL.

LOS ANGELES, CAL.
ARTESIA, N. M.
SALT LAKE CITY, UTAH

DENVER, COLO.
KANSAS CITY, MO.
JOPLIN, MO.

ST. LOUIS, MO.
BIRMINGHAM, ALA.
DALLAS, TEX.

DISTRICT AND SALES OFFICES IN CANADA

MONTREAL, QUE.

CHATHAM, ONT.

CALGARY, ALTA.

EDMONTON, ALTA.

Products

CENTRIFUGAL PUMPS, for water works, irrigation, drainage, mine, fire protection, quarry, dredge, hydraulic, giant, caisson, foundation, sump, trench, bilge, boiler feed, condensing and general purpose pumping.

DEEP WELL TURBINE CENTRIFUGAL PUMPS for pumping wells 12 in. and larger in diameter.

DEEP WELL PLUNGER PUMPS, Single Acting, Double Acting, and 2-stroke.

"American" Centrifugal Pumps

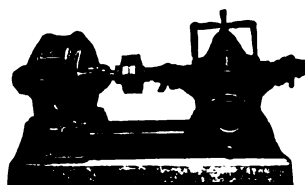
These pumps are built in about 50 standard types, each designated by a letter of the alphabet; and, in addition, a large number of special pumps are designed and built.

Centrifugal pumps are made with either open type or enclosed type impellers, with or without diffusers and with either single suction or double suction in single stage pumps.

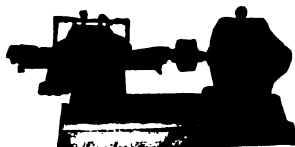
Most of our double suction pumps and some single suction pumps are made with split casing, so designed that the upper half of the casing can be removed to expose the internal working parts without disturbing the pipe connections.

Important Features—The important features of "American" centrifugals are: Skillful designing, so that they attain high efficiencies with flat efficiency curves, thus being economical in use through a wide range of delivery. Use of good material in their construction, careful machining and accurate adjustments. Bearings are ring or chain oiled. Impellers are given both rotative and end thrust balance. In single suction, open impeller type pumps, the sides and edges of impeller and interior of casing are carefully machined and closely adjusted at sides to prevent leakage. The split casing types are fitted with labyrinth rings around suction openings to reduce leakage to minimum. Multistage, enclosed impeller types are designed to have fewest points of leakage back to suction opening.

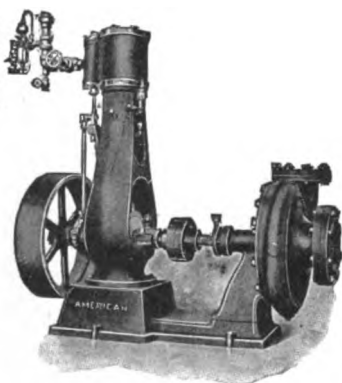
Water for water seal on high pressure side packing box is taken from first stage of the pump, thus reducing friction on shaft.



TYPE DSMD
High pressure, double suction, single stage, split volute, for total heads to 200 ft.



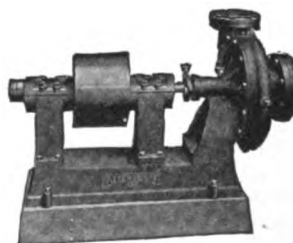
TYPE KTMD
High pressure, multistage, horizontally split casing, motor driven, for total heads up to 1000 ft.



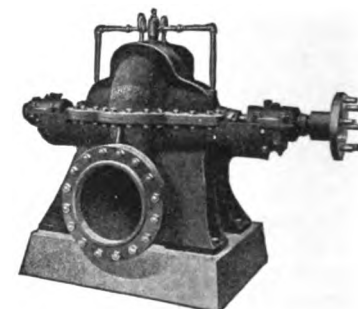
TYPE AED
Low pressure, single stage, horizontal centrifugal pump, direct connected to steam engine, for total heads up to 30 ft.



TYPE PMD
High pressure, single stage, horizontal centrifugal, with gritproof bearing, Motor driven, for total heads to 125 ft.



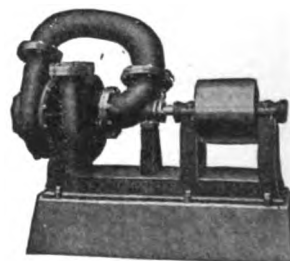
TYPE EE
Single stage, belt driven, high pressure, for heads to 125 ft.



TYPE DS
Double suction, horizontal, split volute, single stage centrifugal, for total heads to 200 ft.



TYPE RMD
High pressure, single stage, double suction, vertical split volute, for total heads to 200 ft.



TYPE I
High pressure, 2-stage, belt driven for total heads to 250 ft.

Multistage opposed impeller types have long radius pipe bends connecting stages in pairs, so that end thrust in one stage is equalized by end thrust in opposite direction in the other stage.

No pump is allowed to leave the works that does not show the efficiency guaranteed under test.

Thrust Balance—"American" multistage, single suction, split casing, centrifugal pumps, with enclosed impellers, are provided with hydraulic thrust bearings in which a rotating disk within pump casing is separated from a stationary disk by a film of water, the water within the enclosed space acting as a hydraulic cushion.

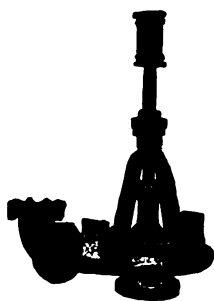
For pumping gritty water, we make a pump with very wide bearings entirely removed from the volute chamber. This pump is known as Type P. Between the bearings in this pump is placed a ball bearing for taking care of end thrust.

Many types of "American" vertical centrifugals and all "American" deep well turbine centrifugals are provided with roller or ball thrust bearings placed at top of the shaft and so designed that the entire weight of shaft and attached impeller, or impellers, is carried at the surface.

Efficiency—Skillful designing and careful workmanship enable "American" centrifugal pumps to compete in point of efficiency with pumps of their kind made by any other manufacturer.

Several standard types of these pumps are designed in larger sizes to maintain their highest efficiencies on total heads up to 200 ft. for each stage. Specially designed pumps that maintain highest efficiencies on total heads of over 400 ft. for each stage have been built by this company, and these pumps attain up to 80% efficiencies.

Equipment—"American" centrifugal pumps are equipped with plain pulley for belt drive, with grooved sheave for rope drive, steam engine, gasoline engine, electric motor, steam turbine, or with hydraulic turbine.



TYPE G

Type C, low pressure, single stage, vertical shaft, for total heads to 50 ft.

Type G, high pressure, single stage, vertical shaft, for total heads to 100 ft.



TYPE Q

High pressure, vertical type, single stage, with submerged water seal, for total heads to 100 ft.
Patented March 7, 1916



TYPE H

High pressure, 2-stage, vertical shaft, for total heads to 150 ft.



TYPE OKMD

Vertical plain centrifugal type mine-sinking pump, direct connected to vertical type motor

The pumps are also supplied unmounted, with flexible shaft coupling for any power, or mounted on a base, but without attached power.

Material—"American" centrifugal pumps are made of all-iron, or of iron with bronze fittings or of all-bronze. For some conditions, special acid resisting metals are used.

Sizes and Capacities—"American" centrifugal pumps are made in any size, from $\frac{3}{4}$ in. to the largest built. They are made in both horizontal and vertical types, and in any number of stages. For approximate capacities, see table on following page.

Deep Well Turbine Centrifugal Pumps

The "American" deep well turbine centrifugal pump is designed to meet conditions which will not permit the use of plain centrifugals when mounted either horizontally or vertically. Made in sizes to operate in wells 12 in. and larger in diameter, inside of casing. Special designs of this pump provide a combination of a deep well turbine, located in the well for elevating water to surface, and a single stage or multistage centrifugal mounted on same shaft at surface and driven by same power, to act as a booster pump for forcing water through mains or into an elevated tank or standpipe.

These pumps are designed to deliver from 200 to 3000 gals. of water per minute.

The turbine may be belt driven from any convenient power; but, where electric power is obtainable, electric motor can be mounted vertically on pump head and thus secure the most compact and economical drive.

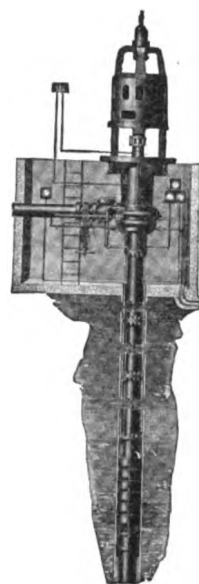
"American" Deep Well Plunger Pumps

The latest practice in deep well plunger pumps is represented in



TYPE GMD

High pressure, single stage, vertical shaft, motor driven, for total heads to 100 ft.



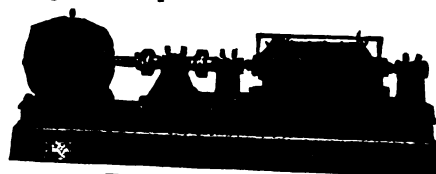
TYPE KNMD

Combination deep well turbine and booster pump. Patented and patents pending



TYPE CMD

Low pressure, single stage, vertical pump, direct connected to vertical type motor; for use in pits to 15 ft. in depth



TYPE KTMD, SPECIAL

the "American" line of this type. These pumps are built in types of power heads for operating single acting, double acting or 2-stroke cylinders. Each of these types of power heads can be adapted to be driven by belt, electric motor, gas or gasoline engine, or by steam engine. Power frame heads are substantially built to meet requirements of high lifts and large volumes of water from deep wells. The bearing boxes on frame, the wrist pin boxes, crank boxes, and the guide through which plunger travels are of large proportions. Bearing boxes are lined with babbitt metal, and run cool under maximum load. Crank shafts are made of steel, while gears and pinions are machine cut.

Compound steam heads are used when steam is delivered to pump at from 80 to 125 lbs. pressure. Special designs of large size deep well plunger pumps, not illustrated, are made with 36-in. stroke. Deep well plunger pumps are made in sizes to operate in wells 3 in. and larger in diameter.

All water cylinders are made of bronze. The double acting cylinder delivers water on both down-stroke and up-stroke, and has about 60% greater capacity than a single acting cylinder of equal diameter and length of stroke. The 2-stroke cylinders are perfectly balanced and have practically double the displacement capacity of a single acting cylinder of equal diameter and length of stroke.

SIZES AND CAPACITIES OF "AMERICAN" CENTRIFUGAL PUMPS

TYPES A, AA, B, E, EE, L, PCG AND Q						
Economical capacity per minute, U. S. gals.			Diameter of discharge, in.	Diameter of suction, in.	Weight, Iron*	
Low head	Medium head	High head			Domestic	Export
10	30	35	1	1½	45	60
30	55	80	1½	2	115	140
40	75	150	1½	2½	125	150
60	125	195	2	3	145	170
110	200	385	2½	3½	215	260
135	265	470	3	4	230	275
225	410	720	3½	5	360	420
250	500	845	4	6	380	440
350	750	1200	5	7	680	790
400	900	1350	6	8	725	1440
600	1550	2200	7	9	950	1490
800	1600	2600	8	10	1280	1520
1100	2600	3950	10	12	2045	2400
1500	4000	5800	12	15	2420	2810
2900	6000	8800	15	15	3040	3500
4500	10000	14000	18	18	5320	6150
6100	13500	18500	20	20	7200	8280
7500	16500	22000	24	24	11400	13200

*Weights given apply only to Type A Pumps

TYPES DS, DSB AND DSMB			TYPES K, KMB, KT AND KTMB		
Diameter of discharge in.	Most economic capacities U. S. gall. per minute, depending on total heads		Diameter of discharge in.	Most economic capacities U. S. gall. per minute, depending on total heads	
1½	65	75	1½	65	75
2	105	125	2	105	125
2½	160	185	2½	160	185
3	225	265	3	225	265
3½	315	370	3½	315	370
4	410	480	4	410	480
5	640	750	5	640	750
6	935	1100	6	935	1100
7	1275	1500	7	1275	1500
8	1620	1900	8	1620	1900
10	2550	3000	10	2550	3000
12	3655	4300	12	3655	4300
15	5525	6500	15	5525	6500
18	8160	9600	18	8160	9600
20	10200	12000	20	10200	12000
24	14450	17000	24	14450	17000
30	22500	26500			
36	32300	38000			
42	44200	52000			
48	57000	67000			
60	85000	100000			



"AMERICAN" HEAVY DEEP WELL STEAM PUMP HEAD
For operating with either single or double acting cylinders

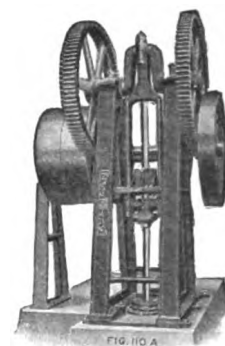


FIG. 110-A No. 3½
"AMERICAN" HEAVY CONSTRUCTION, DEEP WELL, BELT DRIVEN PUMP HEAD
For operating double acting cylinders

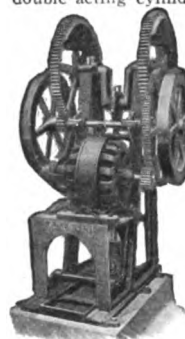


FIG. 110-AMS
"AMERICAN" MOTOR DRIVEN DEEP WELL POWER HEAD
For operating either single or double acting cylinders



FIG. 483
"AMERICAN" MOTOR DRIVEN 2-STROKE DEEP WELL POWER HEAD



FIG. 382-A.
"AMERICAN"
ALL-BRONZE
BALL VALVE
SINGLE ACTING
WATER
CYLINDER

FIG. 380-A. "AMERICAN" ALL-BRONZE DOUBLE ACTING WATER CYLINDER

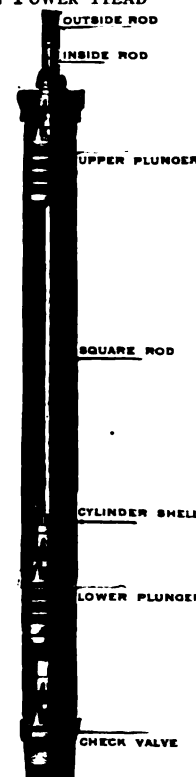


FIG. 195. "AMERICAN" ALL-BRONZE 2-STROKE WATER CYLINDER

AURORA PUMP & MANUFACTURING COMPANY

Manufacturers of Centrifugal and Deep Well Pumps

HOME OFFICE AND FACTORY

AURORA, ILL.

CHICAGO OFFICE: 37 West Van Buren Street

Products

CENTRIFUGAL PUMPS for every service.
DEEP WELL TURBINE CENTRIFUGAL PUMPS.
DEEP WELL PLUNGER PUMPS.

Engineering Service

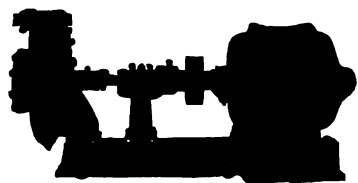
Our engineers are specialists in all hydraulic questions and solicit the privilege of solving your pumping problems.

Aurora Pumps

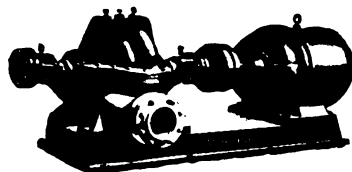
These pumps are the result of more than a quarter-century of practical experience in the designing and building of centrifugal and deep well pumping machinery.

Tests

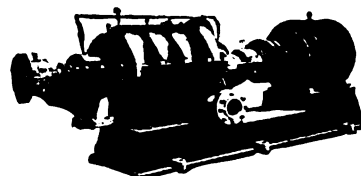
Operating tests and results from present installations prove that Aurora pumps are highly efficient and dependable.



TYPE GMD, SINGLE-STAGE HORIZONTAL HIGH PRESSURE MOTOR DRIVEN CENTRIFUGAL PUMP
Total heads up to 130 ft.



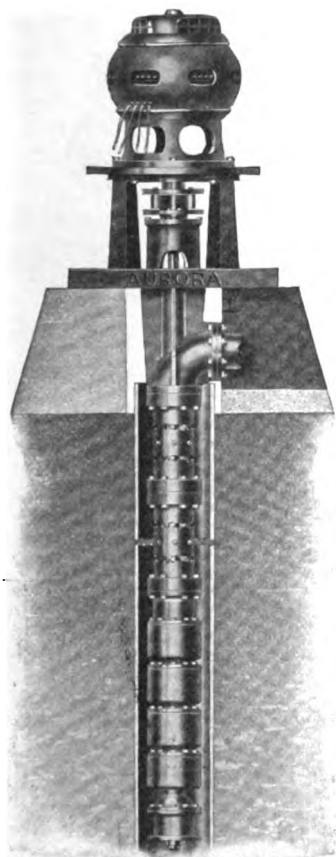
TYPE OMD, SINGLE-STAGE DOUBLE SUCTION HORIZONTALLY SPLIT CENTRIFUGAL PUMP
All sizes



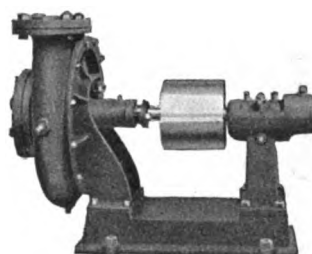
TYPE PMD, MULTISTAGE HORIZONTALLY SPLIT CENTRIFUGAL PUMP



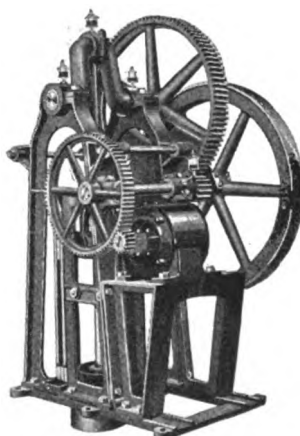
TYPE HH, TWO-STAGE HORIZONTAL HIGH PRESSURE CENTRIFUGAL PUMP
Heads up to 250 ft.



TYPE TMD, DEEP WELL TURBINE CENTRIFUGAL PUMP
Built for 12- to 30-in. wells. For belt drive or direct connection



TYPE G, SINGLE-STAGE HORIZONTAL HIGH PRESSURE BELT DRIVEN CENTRIFUGAL PUMP
Total heads up to 130 ft.



TYPE 100D, MOTOR DRIVEN DEEP WELL POWER HEAD
Built for belt or direct motor drive to meet all conditions

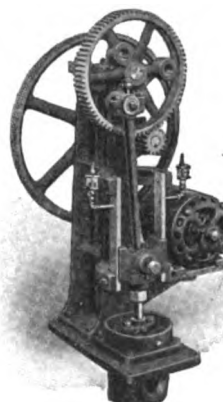


FIG. 150E
Adjustable stroke, 6, 8, and 10 in. Max. h.p. $1\frac{1}{2}$. For installations up to 350-ft. heads; cylinders up to $3\frac{1}{2}$ in.



TYPE KIMB, VERTICAL SINGLE-STAGE CENTRIFUGAL PUMP

Enclosed line shaft, steady bearing, thrust bearing and flexible coupling. Built in all sizes to meet all conditions. Belt or direct motor drive

BUFFALO STEAM PUMP COMPANY

BUFFALO, N. Y.

BRANCH OFFICES

NEW YORK, N. Y., 39-41 Cortlandt Street
 PHILADELPHIA, PA., 1303 Land Title Building
 BOSTON, MASS., 88 Broad Street
 CLEVELAND, OHIO, 368 Kirby Building
 PITTSBURGH, PA., 917 Union Arcade
 DETROIT, MICH., COON DEVISSER Co.
 CHICAGO, ILL., 562 West Washington Boulevard
 WASHINGTON, D. C., Washington Loan & Trust Building
 KITCHENER, ONT., CANADIAN BLOWER & FORCE CO.

KANSAS CITY, MO., J. F. PRITCHARD & Co.
 ST. LOUIS, MO., 515 Chemical Building
 CINCINNATI, OHIO, Mercantile Library Building
 MINNEAPOLIS, MINN., 840-846 Builders' Exchange
 DENVER, COLO., STEARNS-ROGER MFG. Co.
 LOS ANGELES, CAL., 636 H. W. Hellman Building
 CHARLOTTE, N. C., J. W. FRASER & Co.
 NEW ORLEANS, LA., WOODWARD WIGHT & Co.

Products

CENTRIFUGAL PUMPS for all purposes, Single and Double Suction, Single Stage and Multistage, Horizontal and Vertical; STEAM PUMPS, Duplex and Simplex, Inside Packed and Outside Packed.

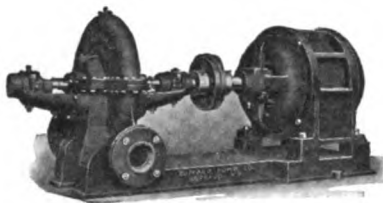
Also manufacturers of Vacuum Pumps and Condensers.

Uses of Buffalo Pumps

For boiler feeding, circulating systems, elevators, fire protection, house and booster service, general water supply, ships, mines, oils, paper stocks, irrigation, reclamation, dry docks, sewage, acids, and all special services.

Class S Pump

Double suction, horizontally divided casing, single stage, built for capacities up to 75,000 g.p.m., and heads up to 180 ft.



CLASS S PUMP

Vertical Shaft Pump

Single bottom suction. Built submerged or non-submerged.

Particularly suited for use in sewage stations.

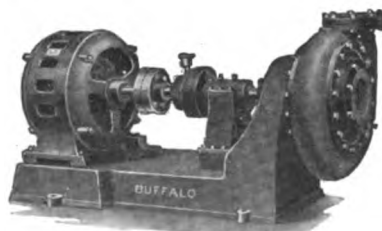


VERTICAL SHAFT PUMP

Paper Stock Pump

For heavy and light stock.

Also built with horizontally divided casing.



PAPER STOCK PUMP

Duplex Piston Packed Pump

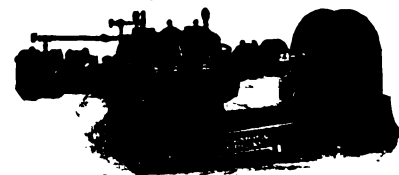
A rugged pump for all general service up to 150 lbs. pressure.



DUPLEX PISTON PACKED PUMP

Class R D S

Built in 2, 3 and 4 stages. Horizontally divided casing, double suction impellers.



CLASS R D S PUMP

Pumps and Receivers

Can be furnished horizontal or vertical.

The Buffalo line also includes duplex steam pumps and receivers.



PUMP AND RECEIVER

Duplex Outside End Packed Pot Valve Steam Pump

For pressures up to 300 lbs.



DUPLEX OUTSIDE END PACKED POT VALVE STEAM PUMP

Sump Pump

Automatic, self-contained. Ball bearing thrust with automatic oil lubrication.



SUMP PUMP

Catalogues

Complete catalogues will be furnished on request.

CHIPPEWA PUMP CO., INC.

Manufacturers of Deep Well Power Pumps

CHIPPEWA FALLS, WIS.

CHICAGO OFFICE, 201 East Ontario Street—Telephone, Superior 8552

Products

SINGLE CYLINDER, DOUBLE PLUNGER DEEP WELL POWER PUMPS.

Range and Adaptability

Chippewa pumps are built in 8 sizes, ranging from 3 to 2500 gals. per minute, *with a particular type for every requirement.* Used in the two smallest sizes in connection with automatic fresh water systems. In all larger sizes they are used for municipalities, railroads, industrial plants, irrigation projects, refrigeration plants, creameries, cheese factories, etc.

The Steady Stream Principle

The fact that liquids can be pumped and discharged in a steady stream by the use of Chippewa pumps is a very important factor when considering any pumping proposition. This non-pulsating feature is obtained by the use of our patented eccentric gear motion and the overlapping of the plungers on their upward stroke. After the pump is once started the column of water never comes to a standstill until the pump is shut down. This means a great saving in power and also eliminates back lashing of the pump rods and racking of the pump parts.

Specifications of Pumps

Frames—Made from close grained gray iron, free from blowholes or sandholes and carefully machined and fitted to standard gages. Frames of exceptionally heavy construction throughout.

Gears—Made from semisteel and in the largest sizes cast steel; teeth are cut from solid blank. In the large size pumps two gears are used to drive each crosshead, giving very even distribution of load and eliminating side thrust.

Pinions—Drive pinions are cut from high carbon steel blanks.

Shafting—Shafts and pins are made from No. 1 cold rolled stock. The drive shaft is of sufficient length to take driving pulleys or gears and carries the drive pinions.

Bearings—Bearings are of very liberal dimensions both as to diameter and length. With the exception of head and drive shafts, which are babbitted, all bearings are equipped with phosphor bronze liners, and provision is made, wherever necessary, for taking up wear.

Crossheads—Made from crucible steel castings and are of very rigid construction. Crosshead pins and connecting rod end pins are set in taper seats, with large lock nuts for tightening in place. Having almost perpendicular upward stroke there is hardly any wear on crosshead guides.

Crosshead Guides—On larger sizes these are gray iron columns carefully machined and fitted with bronze gibs. In the smaller sizes the crosshead guides are of cold rolled steel shafting.

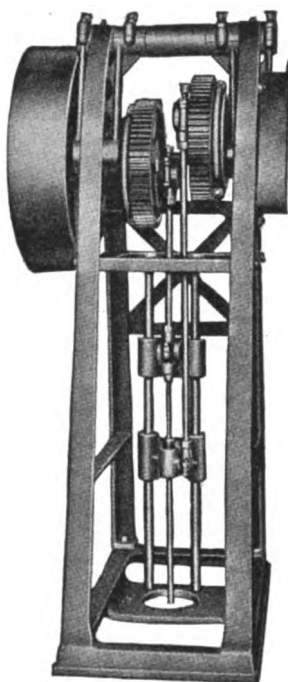
Hangers—Close grained gray iron, accurately machined and fitted with bronze bushings.

Connecting Rods—The connecting rods in the large pumps are crucible steel castings and cold rolled steel in smaller sizes, fitted with all-bronze bearings or lined with special antifriction metal.

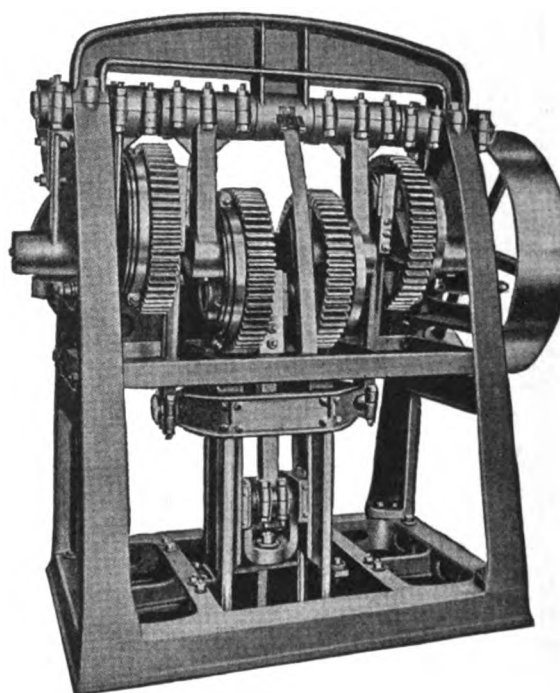
Cylinders—Rolled brass tubing, extra heavy gage.

Plungers—All-brass plungers, with double seat conical valves. Extra large water passages.

The packing head is removable for inspection, and removal of the sucker rods and plungers can be accomplished without disturbing the working head. Extra deep packing glands are provided.



TYPE C-12



TYPE F-24

Guarantee

All Chippewa pumps are guaranteed to satisfactorily fulfil the requirements for which they are recommended.

Bulletins

No attempt is made to fully describe our product on this page, but complete bulletins on any style Chippewa pump will be gladly sent on request.

CHICAGO PUMP CO.

Electric Pumping Machinery

2332 Wolfram Street
CHICAGO, ILL.

Products

Manufacturers of DUPLEX ELECTRIC SEWAGE EJECTORS; RETURN LINE VACUUM PUMPS for heating systems; HIGH and LOW PRESSURE AUTOMATIC CONDENSATION PUMPS and RECEIVERS; HORIZONTAL MULTISTAGE PUMPS; AUTOMATIC ELECTRIC BILGE PUMPS.

Also manufacturers of Turbine Air Line Pumps for heating systems; Pneumatic Water Supply Systems.

Duplex Electric Sewage Ejector

For pumping sewage from basements into sewer. Simplicity of design and construction are predominating features. All working parts are visible and of easy access. No climbing down into the pit to open or close valves or do any adjusting, oiling or repairing.



DUPLEX ELECTRIC SEWAGE EJECTOR

CAPACITIES, HORSEPOWER AND FLOOR SPACE, DUPLEX ELECTRIC SEWAGE EJECTOR

Unit No.	Type of pump and frame No.	Capacity, g.p.m.	Discharge, in.	Motor h.p.	Will pump against a total head, ft.	Floor space required, in.	
						Diam. basin, single pump	Diam. basin, duplex set of pumps
S.H. 300	L-3	75	3	¾	8	36	42
S.H. 301	L-3	75	3	1	11	36	42
S.H. 302	L-3	75	3	1½	16	36	42
S.H. 303	L-3	75	3	2	22	36	42
S.H. 304	L-3	75	3	3	32	36	42
S.H. 305	L-4	75	3	5	40	36	42
S.H. 306	L-3	100	3	¾	7	36	42
S.H. 307	L-3	100	3	1	10	36	42
S.H. 308	L-3	100	3	1½	15	36	42
S.H. 309	L-3	100	3	2	21	36	42
S.H. 310	L-4	100	3	3	30	36	42
S.H. 311	L-4	100	3	5	38	36	42
S.H. 312	L-3	125	3	1	8	42	48
S.H. 313	L-3	125	3	1½	13	42	48
S.H. 314	L-3	125	3	2	17	42	48
S.H. 315	L-3	125	3	3	26	42	48
S.H. 316	L-4	125	3	5	37	42	48
S.H. 317	L-3	150	3	1½	11	42	48
S.H. 318	L-3	150	3	2	15	42	48
S.H. 319	L-3	150	3	3	23	42	48
S.H. 320	L-4	150	3	5	36	42	48
S.H. 321	L-3	200	3	2	12	42	48
S.H. 322	L-3	200	3	3	19	42	48
S.H. 323	L-4	200	3	5	32	42	48
S.H. 324	L-4	200	3	7½	34	42	48
S.H. 325	L-3	250	4	2	10	48	60
S.H. 326	L-3	250	4	3	16	48	60
S.H. 327	L-4	250	4	5	27	48	60
S.H. 328	L-4	250	4	7½	33	48	60
S.H. 329	L-4	300	4	3	14	48	60
S.H. 330	L-4	300	4	5	23	48	60
S.H. 331	L-5	300	4	7½	35	48	60
S.H. 332	L-5	300	4	10	45	48	60
S.H. 333	L-4	350	4	3	12	48	60
S.H. 334	L-4	350	4	5	21	48	60
S.H. 335	L-5	350	4	7½	31	48	60
S.H. 336	L-5	350	4	10	42	48	60

Duplex units include two pumps, two motors, duplex automatic control, strainer and cast iron cover but do not include basin.

All basins should be 48 in. deeper than lowest inlet.

Ejectors up to 1500 g.p.m. are also manufactured; write for complete catalogue.

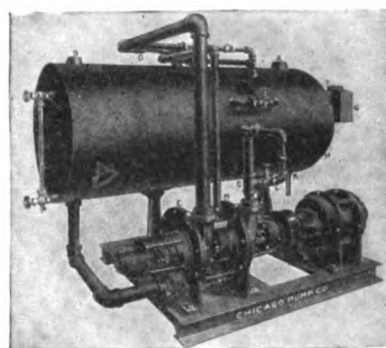
Pumping Machinery

This company specializes in pumping machinery, catering particularly to the building industry. The science and engineering knowledge of a strong organi-

zation of practical pumping engineers are devoted to the production of the finest line of pumping equipment manufactured for this service.

Return Line Vacuum Pump

Direct connected centrifugal type. For maintaining a vacuum on heating system and returning condensation water direct to boiler. No gear, pulleys, belts, valves, etc., in its construction. Complete catalogue on vacuum pumps sent on request.



RETURN LINE VACUUM PUMP

CAPACITIES, HORSEPOWER AND FLOOR SPACE, RETURN LINE VACUUM PUMPS

Unit No.	Sq. ft. radiation	Motor h. p.	Approx. floor space required, in.
S.V. 1	8000	1	55 x 32
S.V. 2	16000	1½	60 x 34
S.V. 3	26000	2	62 x 35
S.V. 4	40000	3	65 x 37
S.V. 5	65000	5	68 x 40

Condensation Pumps and Receivers

These pump the heating returns into boiler from radiation, heating coils, cooking kettles, etc., that may be located below boiler level. They are simple in construction, have very few moving parts, and are quiet in operation. Come all mounted on one base, connected up ready for piping and wiring connections. A complete line of high pressure condensation pumps also manufactured.



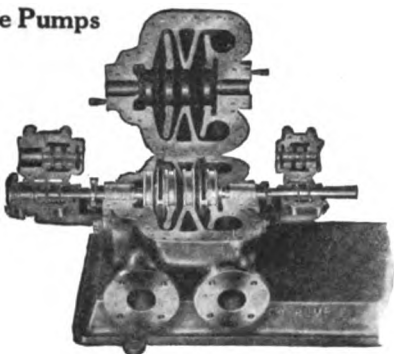
LOW PRESSURE AUTOMATIC CONDENSATION PUMP AND RECEIVER

CAPACITIES, HORSEPOWER AND FLOOR SPACE, LOW PRESSURE AUTOMATIC CONDENSATION PUMP AND RECEIVER

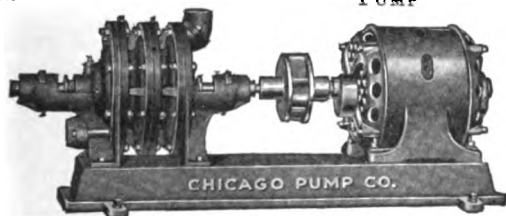
Unit No.	Max. sq. ft. direct radiation	Motor h.p.	Approx. floor space required, in.	Highest water level in receiver from floor line, in.	Unit No.	Max. sq. ft. direct radiation	Motor h.p.	Approx. floor space required, in.	Highest water level in receiver from floor line, in.
S.H. 650	3,000	¼	43x28	26	S.H. 654	20,000	¾	59x32	30
S.H. 651	6,000	½	43x30	26	S.H. 655	25,000	1	59x32	35
S.H. 652	10,000	¾	55x30	30	S.H. 656	35,000	1	61x34	39
S.H. 653	15,000	¾	57x32	30	S.H. 657	50,000	1½	65x36	41

Horizontal Multistage Pumps

Fitted with enclosed type balanced impellers and outer board ring oiled bearings. Best adapted for roof tank filling, hot and cold water circulating, pneumatic water systems, brine circulating; in fact, wherever a quiet running pump is essential.



TYPE HS HORIZONTAL MULTISTAGE PUMP



TYPE M HORIZONTAL MULTISTAGE PUMP

CAPACITIES, HORSEPOWER AND FLOOR SPACE, TYPES M AND HS HORIZONTAL MULTISTAGE PUMPS

Unit No.	Type of pump and frame No.	Suction and discharge, in.	Number of stages	Capacity, g.p.m.	Will pump against a head, ft.	Motor h.p.	Approx. floor space required, in.
S.H. 19	MA	1 1/4	1	25	19	1/2	18 x 38
S.H. 21	MA	1 1/4	1	25	37	1	18 x 39
S.H. 23	MA	1 1/4	2	25	56	1 1/2	19 x 44
S.H. 24	MA	1 1/4	2	25	71	2	19 x 45
S.H. 26	MA	1 1/4	3	25	115	3	19 x 50
S.H. 28	MA	1 1/4	4	25	192	5	24 x 56
S.H. 31	MA	1 1/4	1	35	18	3/4	18 x 39
S.H. 32	MA	1 1/4	1	35	32	1	18 x 39
S.H. 35	MA	1 1/4	2	35	50	1 1/2	19 x 44
S.H. 37	MA	1 1/4	2	35	64	2	19 x 45
S.H. 41	MA	1 1/4	3	35	110	3	19 x 50
S.H. 44	MA	1 1/4	4	35	183	5	24 x 56
S.H. 47	MB	1 1/2	3	35	260	7 1/2	24 x 59
S.H. 48	MB	1 1/2	3	35	274	10	24 x 62
S.H. 51	MA	1 1/2	1	50	20	1	18 x 39
S.H. 53	MA	1 1/2	2	50	40	1 1/2	19 x 44
S.H. 55	MB	1 1/2	1	50	48	2	21 x 45
S.H. 56	MB	1 1/2	1	50	72	3	21 x 48
S.H. 58	MB	1 1/2	2	50	120	5	21 x 54
S.H. 59	MB	1 1/2	2	50	170	7 1/2	24 x 56
S.H. 60	MB	1 1/2	3	50	230	10	24 x 62
S.H. 62	MB	1 1/2	4	50	330	15	30 x 65
S.H. 66	MB	2	1	75	29	1 1/2	21 x 44
S.H. 67	MB	2	1	75	39	2	21 x 45
S.H. 68	MB	2	1	75	58	3	21 x 48
S.H. 70	MB	2	2	75	98	5	21 x 54
S.H. 71	MB	2	2	75	146	7 1/2	24 x 56
S.H. 72	MB	2	3	75	196	10	24 x 62
S.H. 74	MB	2	4	75	290	15	30 x 65
S.H. 79	MB	2 1/2	1	100	30	2	21 x 45
S.H. 80	MB	2 1/2	1	100	45	3	21 x 48
S.H. 81	MB	2 1/2	1	100	75	5	21 x 51
S.H. 83	MB	2 1/2	2	100	112	7 1/2	24 x 56
S.H. 84	MB	2 1/2	2	100	150	10	24 x 59
S.H. 85	MB	2 1/2	3	100	224	15	30 x 62
S.H. 86	MB	2 1/2	4	100	294	20	30 x 67
S.H. 106	MB	2 1/2	1	150	31	3	21 x 48
S.H. 107	MB	2 1/2	1	150	52	5	21 x 51
S.H. 109	MB	2 1/2	2	150	78	7 1/2	24 x 56
S.H. 110	MB	2 1/2	2	150	104	10	24 x 59
S.H. 112	MB	2 1/2	3	150	156	15	30 x 62
S.H. 114	MB	2 1/2	4	150	208	20	30 x 67
S.H. 115	MB	2 1/2	4	150	250	25	30 x 70
S.H. 842	HS	3	1	200	37	5	24 x 60
S.H. 843	HS	3	1	200	56	7 1/2	24 x 62
S.H. 845	HS	3	1	200	112	15	30 x 65
S.H. 846	HS	3	2	200	150	20	30 x 70
S.H. 847	HS	3	2	200	187	25	30 x 72
S.H. 851	HS	3	1	250	32	5	24 x 60
S.H. 853	HS	3	1	250	64	10	24 x 65
S.H. 855	HS	3	1	250	128	20	30 x 68
S.H. 857	HS	3	2	250	192	30	30 x 72
S.H. 858	HS	3	2	250	225	35	30 x 76
S.H. 861	HS	4	1	300	27	5	24 x 60
S.H. 862	HS	4	1	300	40	7 1/2	24 x 62
S.H. 864	HS	4	1	300	82	15	30 x 62
S.H. 866	HS	4	1	300	125	25	30 x 70
S.H. 867	HS	4	2	300	160	30	30 x 72
S.H. 869	HS	4	2	300	215	40	30 x 76
S.H. 871	HS	4	2	350	118	25	30 x 72
S.H. 873	HS	4	2	350	166	35	30 x 75
S.H. 874	HS	4	2	350	190	40	30 x 76

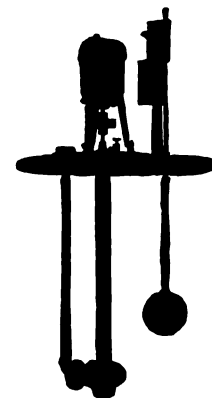
Send for catalogue giving information on pumps of larger capacities and higher heads.

Automatic Electric Bilge Pumps

For pumping water out of basements that are located below the sewer level.

They are the best that modern equipment and skill can produce.

They are fitted with oil lubricated bronze bearings every 5 ft., self-aligning ball thrust bearing, flexible coupling, a double carbon contact type float switch and a Square D main line switch, all mounted on one pedestal. Automatic apparatus is totally enclosed.

TYPE L.G.
AUTOMATIC ELECTRIC
BILGE PUMP**CAPACITIES, HORSEPOWER AND FLOOR SPACE, AUTOMATIC ELECTRIC BILGE PUMPS**

Unit No.	Type of pump and frame No.	Capacity, g.p.m.	Discharge, in.	Motor h.p.	Will pump against a total head, ft.	Floor space required, in.	
						Diam. basin single pump	Diam. basin duplex set of pumps
S.H. 200	LG	15	1	1/4	10	30	42
S.H. 201	LG	15	1	1/2	19	30	42
S.H. 202	LG	15	1	3/4	28	30	42
S.H. 203	LG	30	1 1/4	1/4	7	30	42
S.H. 204	LG	30	1 1/4	1/2	14	30	42
S.H. 205	LG	30	1 1/4	3/4	21	30	42
S.H. 206	LG	30	1 1/4	1	26	30	42
S.H. 207	L-3	30	1 1/4	2	40	30	42
S.H. 208	L-3	30	1 1/4	3	55	30	42
S.H. 209	LG	50	1 1/2	1/4	12	30	42
S.H. 210	LG	50	1 1/2	1/2	18	30	42
S.H. 211	LG	50	1 1/2	1	22	30	42
S.H. 212	L-3	50	1 1/2	1 1/2	28	30	42
S.H. 213	L-3	50	1 1/2	2	38	30	42
S.H. 215	LG	75	2	1/4	8	36	42
S.H. 216	LG	75	2	1/2	14	36	42
S.H. 217	LG	75	2	1	16	36	42
S.H. 218	L-3	75	2	1 1/2	22	36	42
S.H. 219	L-3	75	2	2	30	36	42
S.H. 220	L-3	75	2	3	48	36	42
S.H. 222	LG	100	2 1/2	3/4	8	36	42
S.H. 223	L-3	100	2 1/2	1	14	36	42
S.H. 224	L-3	100	2 1/2	1 1/2	18	36	42
S.H. 225	L-3	100	2 1/2	2	25	36	42
S.H. 226	L-3	100	2 1/2	3	38	36	42
S.H. 228	L-3	125	2 1/2	1	10	36	42
S.H. 229	L-3	125	2 1/2	1 1/2	15	36	42
S.H. 230	L-3	125	2 1/2	2	21	36	42
S.H. 231	L-3	125	2 1/2	3	33	36	42
S.H. 232	L-3	125	2 1/2	5	55	36	42
S.H. 234	L-3	150	3	1 1/2	14	42	48
S.H. 235	L-3	150	3	2	19	42	48
S.H. 236	L-3	150	3	3	28	42	48
S.H. 237	L-3	150	3	5	48	42	48
S.H. 239	L-3	200	3	2	14	42	48
S.H. 240	L-3	200	3	3	22	42	48
S.H. 241	L-3	200	3	5	37	42	48
S.H. 242	L-3	200	3	7 1/2	55	42	48
S.H. 244	L-4	250	4	2	12	42	48
S.H. 245	L-4	250	4	3	20	42	48
S.H. 246	L-4	250	4	5	34	42	48
S.H. 247	L-4	250	4	7 1/2	50	42	48
S.H. 249	L-4	300	4	3	17	48	60
S.H. 250	L-4	300	4	5	28	48	60
S.H. 251	L-4	300	4	7 1/2	44	48	60

Units include pump, motor, complete automatic apparatus, cast iron basin cover, but do not include basin.

All basins should be 36 in. deeper than lowest inlet.

Bilge pumps up to 1500 g.p.m. are also manufactured; write for complete catalogue.

Engineering Department

Our engineers will gladly determine the size and style pumps you require, prepare specifications, and give detail information covering pumps.

You will find this department a great help.

New Catalogue and Reference Tables

Our new catalogue in two colors with complete description of the full line, and with a large number of valuable tables giving engineering data on pumping equipment, will be sent on request.

A. D. COOK, INC.

Deep Well Pumps, Strainers and Accessories LAWRENCEBURG, IND.

Products

Manufacturers of COOK PATENT BRASS TUBE WELL STRAINERS; DEEP WELL PUMPS, single and double stroke, steam, belt and motor driven.

Also, Cylinders (Working Barrels), Foot Valves, Sucker Rods, Well Tools and Accessories.

Brass Tube Well Strainers

The Cook strainer offers the most direct passage from sand stratum into the well, while the area of opening per lineal foot is equal to or greater than that of any other strainer. The absence of pockets for lodgment of sand and the low friction due to free passages materially increase the efficiency of this strainer.

Construction—The outstanding superiority of the Cook strainer is found in its strong integral construction. It is made from special hard drawn seamless brass tubes coupled securely to any desired length. Where electrolysis or mineral contents of the water would pit the strainer by attacking the zinc in the brass tubes, the tubes are made of pure copper, free from zinc.

The slots are milled uniformly and accurately from the inside of the metal tube. They are wider on the inside than on the outside preventing choking up by allowing the free passage of any particle which enters through them.

The length of the strainer is governed by the conditions of drilling, pumping and well construction.

Bulletin No. 30A giving full details of the Cook strainer will be sent on request.



WELL
STRAINER
WITH
STANDARD
FITTINGS

GAUZE NUMBER EQUIVALENTS

Gauze No.	120	100	90	80	70	60	50	40	30	20
Slot No.	4	5	6	7	8	10	14	20	25	40

MAY 1, 1919 DATA AND PRICE LIST COOK STRAINERS

Nominal size (inside diam. of well pipe), in.	Price		Diameters, in.			Approx. weight per ft., lbs.	Swedge block and bar (used for expanding lead packer)	
	Strainer per ft.	Standard fittings	Outside	Through packer	Through coupling		Price	Weight, lbs.
2	\$4.25	\$3.00	1 1/4	1 1/4	1 1/4	3	\$6.00	3
2 1/2	5.00	3.50	2 1/4	1 1/2	1 1/2	3 1/2	7.00	4
3	6.00	5.00	2 3/4	2 1/4	2 1/4	3 1/2	8.00	7
3 1/2	6.75	6.00	3 1/4	2 3/4	2 3/4	5	9.00	10
4	8.00	8.00	3 3/4	3 1/4	3 1/4	6 1/2	10.00	14
4 1/2	9.25	8.50	4 1/4	3 3/4	3 3/4	7	11.00	17
5	10.00	9.50	4 3/4	3 3/4	3 3/4	8 1/2	12.00	21
6	12.50	14.00	5 1/2	4 1/2	4 1/2	10	13.00	30
7	16.00	17.00	6 1/2	5 1/2	5 1/2	15	14.00	40
8	19.00	21.25	7 1/2	6 1/2	6 1/2	16	15.00	50
9	22.25	26.00	8 1/2	7 1/2	7 1/2	18		
10	27.75	35.00	9 1/2	8 1/2	8 1/2	20	20.00	75
12	39.25	52.50	11 1/2	10 1/2	10 1/2	30	25.00	100
14	52.00	75.00	13 1/2	12 1/2	12 1/2	35	30.00	
15	56.50	98.00	14 1/2	13 1/2	13 1/2	40	35.00	146

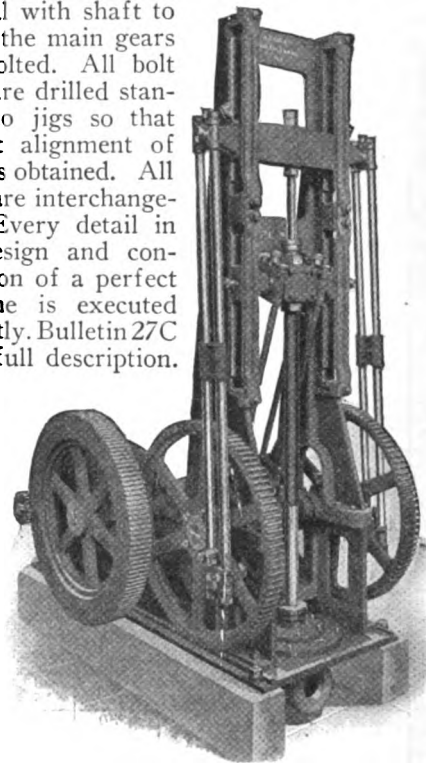
A 6-in. 15-ft. strainer lists as follows:

15 ft. of strainer at \$12.50	\$187.50
Standard fittings	14.00
	\$201.50

Double Stroke Deep Well Pump

Operation—The double stroke pump head actuates two plunger valves in the working barrel, one lifting water while the other is filling. The upper plunger is attached to the lower crosshead of the pump head by a line of hollow rods and the lower plunger is attached to the upper crosshead by a line of solid rods, the rods being furnished in matched weights and lengths.

Distinctive Features—The center of gravity is down close to the base plate, causing the pump to operate without vibration and eliminating any tendency toward top-heaviness, also rendering the pump more accessible for oiling and inspection. The crank shaft is a crucible nickel steel casting, heat treated, with flanges integral with shaft to which the main gears are bolted. All bolt holes are drilled standard to jigs so that perfect alignment of gears is obtained. All gears are interchangeable. Every detail in the design and construction of a perfect machine is executed perfectly. Bulletin 27C gives full description.



SIZE 2L DOUBLE STROKE DEEP WELL
PUMP DIRECT CONNECTED TO
15 H. P. ELECTRIC MOTOR

DOUBLE STROKE DEEP WELL PUMPS

Working barrel, in.		Capacity U. S. Gal. (Actual plunger displacement)		Size of drop pipe, in.	Diam. smallest size well that drop pipe will go in, in.	Size no. of pump rod
Inside diam.	Length of tube	Per rev.	At 30 r. p. m.			
3 3/4	84	1.72	51.6	4	5 1/2	1 1/2
4 1/4	84	2.21	66.3	4 1/2	6	1 1/2
4 1/2	84	2.47	74.1	*4 3/4	6	1 1/2
4 3/4	84	2.76	82.8	5	7	2
5 1/4	84	3.37	101.1	*5 3/4	7	2
5 3/4	84	4.04	121.2	6	8	2
6	84	4.4	132	*6 1/4	8	2
6 1/4	84	4.78	143.4	*6 3/4	8	2
6 3/4	84	5.57	167.1	7	9	2
7 1/4	96	6.43	192.9	*7 3/4	9	2
7 3/4	96	7.34	220.2	8	10	2 1/2
8	96	7.83	235	*8 1/4	10	2 1/2
8 3/4	96	9.37	281.1	9	12	2 1/2
9 3/4	100	11.63	348.9	10	12	2 1/2
11 3/4	100	16.9	507.2	12	15	3

*Casing threaded for inches.

The foot valve may be left out as it does not affect the quantity discharged by the plungers when the valves and leathers are in good condition.



ALL
BRASS
WORKING
BARREL

COPPUS ENGINEERING & EQUIPMENT CO.

Manufacturers of Turbo Boiler Feed Pumps and Steam Turbines

340-350 Park Avenue
WORCESTER, MASS.

BRANCH OFFICES AND AGENCIES

BIRMINGHAM, ALA.
CHICAGO, ILL.
CLEVELAND, OHIO
DENVER, COLO.

HAZLETON, PA.
LOS ANGELES, CAL.
MONTREAL, QUE.
NEW ORLEANS, LA.

NEW YORK, N. Y.
PHILADELPHIA, PA.
PITTSBURGH, PA.
ST. LOUIS, MO.

ST. PAUL, MINN.
SALT LAKE CITY, UTAH
VANCOUVER, B. C.
WINNIPEG, MAN.

Products

CENTRIFUGAL TURBO BOILER FEED PUMPS.

For the Coppus Vano Blower, see page 669.



Coppus Centrifugal Turbo Boiler Feed Pumps

Advantages—Simplicity of Construction—Only one rotating element. Single-stage pump has only one stuffing box at pump end; 2-stage pump only two stuffing boxes, metallic packed. Mechanical box at steam end requires no attention whatever. No complicated governing devices and no sliding valves.

Continuous, Steady Flow of Water Without Pulsation—This means longer life to pipe lines, valves, fittings and pipe joints.

Great Flexibility, Constant and Easy Control of Feed Capacity—Regulated by throttling of hand feed valve at boiler or automatically by feed water control in discharge line.

Exhaust Steam Free from Oil—Can be used directly for heating purposes.

Lower Upkeep and Less Attention Required—Pump runs with very little attention. Oiling system requires only occasional refilling. No valves to be re-ground, no pistons to be repacked. Mechanical packing box on steam side is frictionless.

Longer Life and Less Depreciation—Very best materials used in construction, and particular attention given to rotating system. Few moving parts, and only ball bearings and wearing rings are subject to wear. No cylinders to be rebored and rebushed and no minor repairs.

Higher Steam Economy—Efficiency remains practically constant during years of use.

Less Floor Space—Requires less floor space than for a reciprocating pump of corresponding capacity or a 2-unit turbine or motor driven centrifugal pump.

Complete Unit Built in One Plant—The responsibility of our organization stands squarely behind the complete unit, which can be supplied from stock.

General Description—The Coppus centrifugal turbo boiler feed pump is a complete unit in itself. The complete rotating element is mechanically and hydraulically balanced. Excess pressure pump governor, safety stop valve and steam strainer are furnished with each unit. Cast iron base plate supplied if desired.

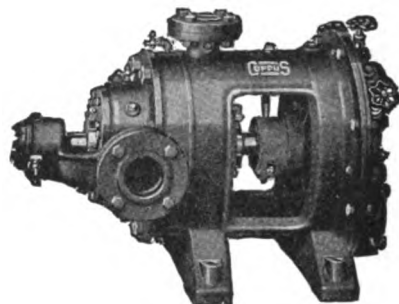
Type CCC Single Stage—Single-stage water end with one single suction enclosed impeller. One oil reservoir serves both bearings and on account of ingenious ring oiling lubricating system, oil level for ball bearings is maintained regardless of amount of oil in lower oil chamber. Ball bearings are the best obtainable.

Mechanical steam packing box on steam end is adjustable, frictionless, and good for back

pressures up to 10 lbs. One stuffing box, metallic packed, is on water end.

Type TB Double Stage—Double-stage water end, with two single suction enclosed impellers and two enclosed guide vane rings to transform kinetic energy of water into pressure. Turbine is of the two-row velocity stage impulse type with stationary reversing sector between two rows of buckets.

Extra heavy double row deep groove ball bearing at turbine end and double row self-aligning ball bearing at pump end are oil-ring lubricated. Oil in upper chambers is maintained at proper level, independent of amount in the lower reservoirs.



2-IN. TYPE TB COPPUS CENTRIFUGAL TURBO BOILER FEED PUMP

COPPUS CENTRIFUGAL TURBO BOILER FEED PUMPS

	TYPE CCC				TYPE TB		
Size.....	1½	1½	2	3	1½	2	3
Capacity, g.p.m.....	10-40	40-80	80-125	125-275	40-80	80-125	125-275
Max. dis. water pres., lbs.	135	140	150	150	280	300	300

Coppus Steam Turbines

The superiority of steam turbine drive is a well established fact. Only one rotating element gives high reliability of operation and low upkeep.

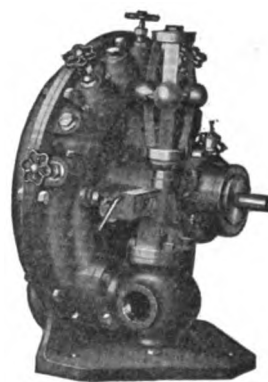
Free rotating motion of turbine wheel gives longer life and maintenance of original high steam economy. Superheated steam increases efficiency.

Exhaust steam, free from oil, can be used directly for heating or drying, and condensation may be returned to boiler without use of oil separators.

A steam turbine is a high speed machine, with increasing economy at higher speeds. Adapted for direct connection to pumps, blowers and generators. Steam turbine takes its energy direct from boiler.

Turbine frame has heavy bearing housing cast integrally with substantial supporting structure.

Briefly, the advantages are: Simplicity of design, less floor space, maintained alignment, low speed governor, low steam consumption, high critical speed.



20-IN. TYPE TC STEAM TURBINE

THE DEMING COMPANY

Manufacturers of Hand and Power Pumps for All Uses
SALEM, OHIO

GENERAL AGENCIES FOR DEMING POWER PUMPS

ATLANTA, GA., DUNN MACHINERY Co., 522 So. Pryor Street
BIRMINGHAM, ALA., MOORE-HANDLEY HARDWARE Co.
BOSTON, MASS., CHARLES J. JAGER Co., 13-15 Custom House Street
BUFFALO, N. Y., ROOT, NEAL & Co., 178-80 Main Street
CHARLESTON, W. VA., CHARLESTON ELECTRICAL SUPPLY Co.
CHICAGO, ILL., HENION & HUBBELL, 223-31 No. Jefferson Street
DENVER, COLO., HENDRIE & BOLTHOFF MFG. & SUPPLY Co.
DETROIT, MICH., KERR MACHINERY CORPORATION, Kerr Building
EL PASO, TEX., KRAKAUER-ZORK Co.

CANADA: MONTREAL, TORONTO, WINNIPEG, DARLING BROS., LTD.

KANSAS CITY, MO., ENGLISH TOOL & SUPPLY Co.
LOS ANGELES, CAL., R. W. SPARLING, 945 No. Main Street
NEW ORLEANS, LA., GIBBENS-FINNEY-GORDON Co.
NEW YORK, N. Y., RALPH B. CARTER Co., 152 Chambers Street
PHILADELPHIA, PA., W. P. DALLETT Co., 922-24 Sansom Street
PITTSBURGH, PA., HARRIS PUMP & SUPPLY Co., Second Avenue
RICHMOND, VA., SYDNOR PUMP & WELL Co.
SALT LAKE CITY, UTAH, SALT LAKE HARDWARE Co.
SAN FRANCISCO, CAL. and PORTLAND, ORE., CRANE Co.

Products

DEMING PUMPING MACHINERY for operation by any power: TRIPLEX POWER PUMPS; PISTON PUMPS; DEEP WELL POWER WORKING HEADS; ARTESIAN WELL CYLINDERS.

Also manufacturers of Deming Hydro-pneumatic Water Systems, operated by hand or windmill, gasoline engine, or electric motor; Diaphragm Pumps; Rotary Pumps; Hydraulic Pressure Test Pumps; Deep Well Power Pumps; Trench Pumps; Air, Ammonia, Creamery, Bilge, Sewage and Sump Pumps; Pumping Outfits, stationary and portable.

Agencies for Deming Pumps

Many agencies, not mentioned above, carry in stock Deming hand and windmill pumps and cylinders, spray pumps, hydraulic rams, etc. The above agencies, however, specialize on Deming power pumps.

Co-operative Engineering Service

Manufacturers, engineers, and others are invited to refer pumping and water system problems to the engineering department of this company. On receipt of layout of conditions and statements of requirements, an estimate for the pumping equipment will be submitted. Blue prints, also photographs showing typical installations, on request.

Information Required for Estimate Basis

(1) For what purpose pump is to be used; (2) maximum quantity to be pumped per minute, hour or day of 24 hours; (3) to what height liquid is to be lifted by suction, and diameter and length of suction pipe; (4) height or pressure against which liquid is to be discharged; (5) diameter and length of discharge pipe; (6) whether liquid to be pumped is hot or cold, salt or fresh, acid or clear, thick or gritty; (7) power available for driving pump; (8) if electric motor, state whether current is direct or alternating; if direct, give voltage; if alternating, state voltage, cycle and phase; (9) advise if pump is to be driven by belt from motor, or to have same direct connected by gearing or otherwise.

Catalogues and Bulletins

General Catalogue No. 26; 256 pages. Lists the complete Deming line, with exception of triplex power pumps, of which only a few types are shown.

Bulletin No. 300, 40 pages, triplex power pumps.

Bulletin No. 310-A, 24 pages, horizontal piston power pumps.

Bulletin No. 320-A, 32 pages, power deep well working heads, cylinders, etc.

Water System Catalogue "D," 40 pages, complete hydro-pneumatic systems of water supply.

Triplex Power Pump, Fig. 50

Standard design, single acting; designed for suction lift of 25 ft. or less.

Frame—Of large sizes, made in one casting with guides and crank shaft bearings lined with antifriction metal. In sizes 4x4 in. and smaller, frame and cylinder cast in one piece.

Crank Shaft—Best open hearth steel casting; one piece.
Gearing—Machine cut, and is double in sizes 9x10 in. and larger. Gear ratios 5 to 1.

Pinion Shaft—Of steel, running in antifriction metal, and bolted to main housings.

Connecting Rods—In sizes 4x6 in. and larger, have bronze boxes with wedge and screw adjustment at crosshead end, and marine type babbitted boxes at crank end. Smaller sizes have bronze bushings at crosshead ends.

Crossheads—Run in bored guides. Sizes 4x6 in. and larger have bronze adjustable shoes.

Plungers—Best cast iron, finished true and smooth; packing of ample depth.

Cylinder and Base—One casting in sizes 10x10 in. and smaller; in larger sizes, cylinders are separate castings.

Valve Chambers—In sizes 3½x4 in. and larger, separate castings bolted to cylinders.

Valves—Large area and readily accessible—for cold water are rubber disks, protected on top from cylindrically

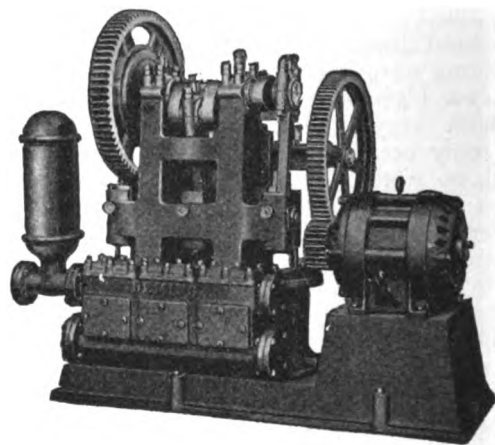


FIG. 50. TRIPLEX POWER PUMP
Size 5½x8 in. with Type "B" drive

SIZES AND CAPACITIES, FIG. 50 TRIPLEX POWER PUMP

Plungers, in.		Capacity		Max-imum working pressure, lbs	Diameter pipes, in.		*Tight and loose pulleys, in.	Code Word
Diam-eter	Stroke	Usual r.p.m.	G.p.m.		Suction	Dis-charge		
2	2	70	5.67	150	1½	1	8x 2	Obese
2½	2	70	8.89	150	1½	1	10x 2	Obelise
2½	3	60	11.4	150	2	1½	12x 3	Oaken
3	3	60	16.2	150	2	1½	14x 3	Oath
3½	3	60	22.	150	2	1½	16x 3	Oaking
3½	4	60	30.	150	2½	2	18x 4	Obelus
4	4	60	39.	150	2½	2	18x 4	Oakum
4½	4	60	59.	160	2½	2	20x 5	Oarman
5	6	60	74.	150	3	2½	20x 5	Oaky
5½	6	60	91.	150	3	2½	24x 5	Oasis
6	8	60	147.	150	4	3	28x 6	Outmeal
6½	8	55	161.	140	4	3	30x 6	Obdurate
7	8	55	220.	150	5	4	30x 8	Obdurate
8	8	55	287.	150	5	4	36x 8	Obiter
8½	8	55	324.	140	6	5	36x 8	Obdure
9	10	50	413.	160	8	6	42x 10	Obloquy
10	10	45	459.	150	8	6	42x 12	Obmagnate
11	12	42	622.	160	10	8	48x 14	Obdust
12	12	42	740.	150	10	8	48x 16	Obduction
12	14	40	820.	150	12	10	48x 18	Observance
13	14	40	964.	140	12	10	48x 20	Observant

*Note—Sizes 9x10 and larger regularly furnished with tight pulley only.

wound springs by brass plates; for hot water are either special hard composition or bronze valves.

Valve Seats—Bronze, of grid type, screwed into decks. Iron seats and valves furnished, if required.

Grease Cups—Furnished with all pumps

Pumps furnished with bronze plungers, and varying otherwise from standard construction, at extra price.

Many other power pumps, also different types of drives are shown in the power pump bulletins.

Single Acting Triplex Plunger Pump, Fig. 48

For belt, chain or gear drive. Especially designed for pumping into open or compression tanks in apartment houses, residences, office buildings, or wherever quietness of operation is essential. These pumps have unusually large valve area, which permits operating at much higher speed than is the usual practice with geared pumps, resulting in much greater capacity for the space occupied.

Frame consists of three standards, which include the crosshead guides and the main crank shaft bearings, the latter being lined with best antifriction metal.

Crank shaft is best open hearth steel; one piece.

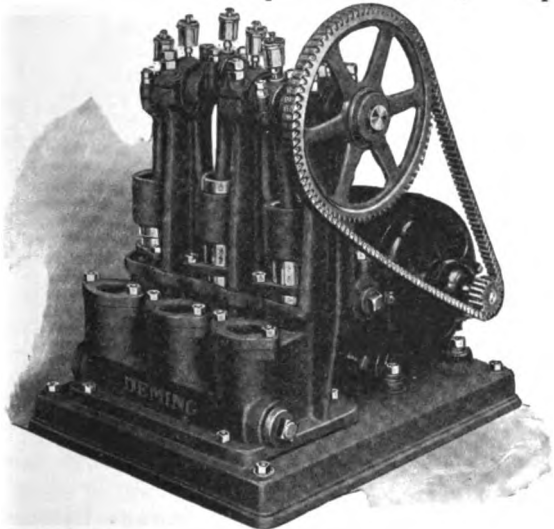


FIG. 48. SINGLE ACTING TRIPLEX PLUNGER PUMP

Sizes, 2x2 in. to 3½x3 in., with Type "B" drive
STANDARD SIZES AND CAPACITIES, FIG. 48

Plungers, in.		Capacity		Max-imum work. press., lbs.	Diameter pipes, in.		*Pulley, in.	Code word
Diam-eter	Stroke	Usual r.p.m.	G.p.m.		Suc-tion	Dis-charge		
1½	1½	140	4.8	100	1¼	1	16x 3	Oxpeck
2	2	120	9.7	100	2	1½	24x 3	Oxalite
2½	2	120	15.2	100	2	1½	30x 3	Oxamide
2½	3	110	21.0	100	2½	2	36x 3	Oxide
3	3	110	30.2	100	2½	2	42x 3	Oxidation
3½	3	110	41.2	100	2½	2	48x 3	Oxidator
3½	4	95	47.4	100	3	2½	42x 4	Oxidic
4	4	95	61.7	100	3	2½	48x 4	Oxonian
4	6	85	83.3	100	3½	3	48x 5	Oxen
4½	6	85	105.4	100	3½	3	48x 6	Oxbow
5	6	85	130.0	100	3½	3	48x 6	Oxeyed
5½	8	75	184.5	100	5	4	54x 8	Oxpith
6	8	75	220.5	100	5	4	60x 8	Oxytone
7	8	75	300.0	100	6	5	60x10	Oxidable

*Pumps regularly furnished with tight pulley only; loose pulley at extra price.

Fig. 48 can be driven by chain direct from motor; or by gear.

"Ajax" Double Acting Piston Pump, Fig. 716

For medium service. Especially recommended as a gathering pump and for other use in mines where maximum discharge pressure does not exceed 75 lbs. Also very desirable for brine circulation and for tank supply for factories, railway water stations, etc.

Main frame is of heavy box type and includes bored crosshead guide and babbitt lined shaft bearings.

Cylinder, of cast iron with cast bronze liner, contains valves readily accessible without disturbing pipe connections. Piston is fibrous packed.

Standard construction includes tight and loose pulleys, grease cups, wrenches and companion pipe flanges of sizes listed. Modifications of standard construction furnished at extra price.

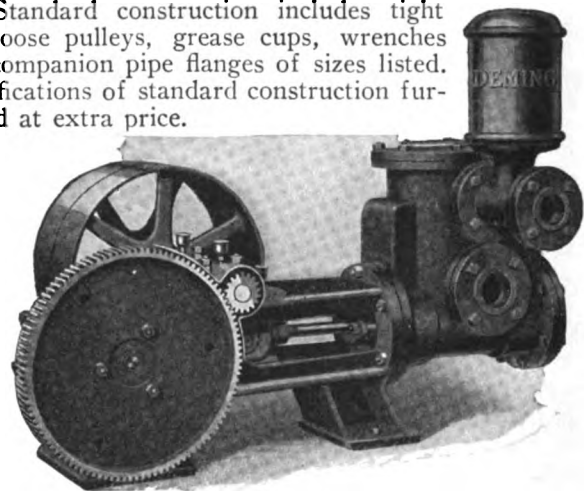


FIG. 716. "AJAX" DOUBLE ACTING PISTON PUMP
For medium service. All sizes

SIZES AND CAPACITIES, FIG. 716

Pistons, in.		Capacity		Max-imum working pressure, lbs.	Diameter pipes, in.		Tight and loose pulleys, in.	Height with type "B" drive, in.
Diam-eter	Stroke	R.p.m.	G.p.m. at max-imum speed		Suc-tion	Dis-charge		
4	5	50 to 60	31.04	75	2	2	14x3	35
5	5	50 to 60	49.98	75	2½	2	16x4	35½
5	6	45 to 55	55.00	75	3	2½	18x4	39½
6	6	45 to 55	79.64	75	3	2½	20x5	37½
6	10	40 to 50	119.75	75	4	3	24x5	46
7	10	40 to 50	163.95	75	5	4	28x5	56
8	10	40 to 50	213.75	75	6	5	30x6	57

Deep Well Power Working Head, Fig. 80

With differential plunger, is designed for operation of deep well cylinders (Fig. 324), and contains many desirable features which experience indicates as the best.

Bearings—Lined with best antifriction metal; pinion shaft bearings bolted to main housings.

Gearing—Machine cut; main gear bolted to a large flange integral with the crank shaft.

Connecting Rod—Steel. Marine type box at crank end; bronze bushing at crosshead end.

Crosshead—Has bronze shoe adjustable for wear, and runs in polished guides.

Differential Plunger—Equalizes flow of water; increased economy and ease of operation.

Air Chamber—Supplied; also grease cups.

Discharge—Connected either front or back.

For direct connecting electric motor or steam engine, we furnish with different types of drive. See power pump bulletins.

MAXIMUM SPEED AND CAPACITY PER MINUTE WITH FIG. 324 SINGLE ACTING CYLINDER

Diam-eter cylinder, in.	16-in. stroke		24-in. stroke		†Max. depth of well, ft.
	Revs.	Gals.	Revs.	Gals.	
4¼	35	34	28	41	540
4½	35	42	28	51	450
5¼	35	52	28	63	360
5½	35	62	28	75	300
6¼	35	74	28	89	250
6½	35	86	28	104	210
7¼	35	114	28	137	150
8½	35	137	28	164	130

†From lowest surface of water in well to highest point of delivery.

SIZES AND CAPACITIES, FIG. 80

Stroke, in.	Max. diam. of pipes, in.		Gear ratio	Tight and loose pulleys, in.	Hght. in.	Code Word
	Suc-tion	Dis-charge				
16	9	4	6 to 1	28 x 6	76	Orient
24	9	4	5¼ to 1	36 x 6	98½	Oriental

FIG. 324
BRASS
ARTESIAN
WELL
CYLINDER

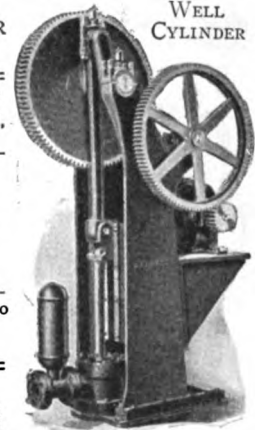


FIG. 80. DEEP WELL
POWER WORKING
HEAD

ECONOMY PUMPING MACHINERY CO.

TELEPHONE
MONROE 5941

106-110 North Curtis Street
CHICAGO, ILL.

Products

PUMPS and RECEIVERS; SEWAGE and BILGE PUMPS;
SEWAGE EJECTORS; VACUUM and BOILER FEED PUMPS;
CENTRIFUGAL PUMPS.

Automatic Condensation Pump and Receiver

Built specially to handle hot water. Direct connected by flexible coupling to motor. Automatic control consists of a float switch enclosed in steel cabinet, and where necessary self-starters are also included. Control is actuated by extra heavy seamless copper float in receiver; it stops motor when water has been discharged into boiler.

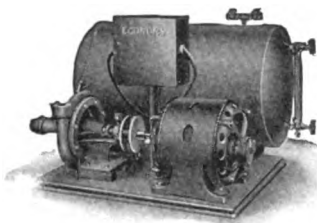


FIG. 2176

DATA, FIG. 2176

Unit No.	Capacity, sq. ft. rad.	Boiler press., lbs.	H.p.
6	2000	10	1/4
6 1/2	3500	10	1/2
7	5000	10	3/4
7 1/2	7500	15	1
8	10000	15	1 1/2
8 1/2	15000	15	2
9	25000	15	3
9 1/2	35000	25	5
10	50000	25	

Automatic Underground Pump and Receiver

Designed for use where radiation is placed on basement floor or where returns from heating apparatus are located below floor. Receiver, which is made of cast iron (or steel where preferred), can be placed below floor level at depth desired to clear returns and motor is located above floor free from dirt or dampness, which usually causes trouble when using a horizontal outfit placed in pit in order to have receiver low enough to receive condensation.



FIG. 2175

DATA, FIG. 2175

Unit No.	Capacity, sq. ft. rad.	Boiler press., lbs.	Motor, h.p.	Diameter, in.	Depth, in.
9	2000	8	1/4	20	30
12	3500	10	1/2	24	30
15	5000	10	3/4	24	36
17	7500	15	1	30	36
20	10000	15	1 1/2	36	36
21	15000	15	2	36	42
23	25000	15	2	36	42

Economy Automatic Centrifugal Vacuum and Boiler Feed Pumps

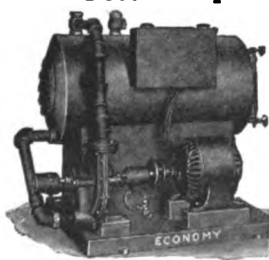


FIG. 2234

DATA, FIG. 2234

Unit No.	Cap., sq. ft. rad.	Motor, h.p.	Cu. ft. air min.	Size boiler feed, in.	Size return inlet, in.
C. V. 1	2500	3/4	13 1/4	3/4	1 1/2
C. V. 2	5000	1	4	1	2 1/2
C. V. 3	8000	1 1/2	6	1 1/4	3
C. V. 4	15000	2	10	1 3/4	3 1/2
C. V. 5	20000	3	15	2	4
C. V. 6	27500	5	19	2 1/2	4 1/2
C. V. 7	40000	7 1/2	24	3	5
C. V. 8	65000	10	40	4	6

pits, cesspools, catchbasins, sewage sumps, etc. They are thoroughly machined and fitted with special self-lubricating bearings where pump dips into fluid, in addition to the oil or grease regularly provided. Of sturdy construction and thoroughly dependable.



FIG. 2104,
TYPE B

Type B, duplex; type C, single pump. Speed up to 95 g.p.m., 1750 r.p.m.; units above 100 g.p.m., 900 to 1200 r.p.m.

In ordering always specify dimensions of basin.

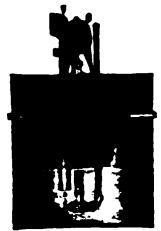


FIG. 2104,
TYPE C

DATA, FIG. 2104, TYPES B AND C

Gals. per min., per pump	7 to 12	10 to 15	15 to 20	20 to 30	35 to 50	60 to 75	80 to 100	125 to 150	200 to 250	300 to 400	500 to 725	800 to 1200
To pump against head, ft.	8 to 12	10 to 14	12 to 20	15 to 30	15 to 30	15 to 35	15 to 35	15 to 35	15 to 40	15 to 40	15 to 40	15 to 40
H. p.	1/4	1/4	1/4	1/2 to 3/4	1/2 to 1	1 to 1 1/2	1 to 2	2 to 3	3 to 5	5 to 7 1/2	7 1/2 to 10	10 to 15
Discharge pipe, in.	3/4	1	1 1/4	1 1/2	2	2 1/4	2 1/4	3	3 1/4 to 4	4	5 to 6	7 to 8
Diam., in., of basin, Type C	20, 24, 30	20, 24, 30	20, 24, 30	24, 30, 42	24, 30, 42	24, 30, 36, 42	24, 30, 36, 42	36, 42, 48	36, 42, 48	48, 54, 60	48, 54, 60	54, 60, 72
Depth of basin	Optional to suit requirements											

For duplex units add 20 in. to minimum diameter of basin

Dry Pump Chamber Automatic Sewage Ejector

Used in places where uninterrupted service is imperative. The dry pump chamber permits examination, renovation or repair without shutdown. So accessible that disagreeable work and odors are practically done away with. They are fully automatic.



FIG. 2119

DATA, FIG. 2119

Unit No.	4	5	6	7	8	9
Capacity each pump, gals.	50 to 75	100 to 125	150 to 175	200 to 250	300 to 400	450 to 600
H. p.	1 to 1 1/4	1 1/2 to 2	2 to 3	3 to 4	4 to 5	5 to 10
Standard speeds	1000 to 1200	1000 to 1200	850 to 1200	850 to 1200	550 to 1000	550 to 1000
Discharge pipe, in.	3	4	4	5	6	8
Diam. pump chamber, in.	48	48	48	54	54	60
Diam. sewage recept., in.	78	78	78	84	84	90

Horizontal and Vertical Split Case Centrifugal Pumps

Made in sizes 10 to 2500 gals. per minute. Bronze fitted. High grade. Designed for both low and high head pressures.



FIG. 2235

Economy Automatic Sewage and Bilge Pumps

These bilge and sewage pumps are built for all classes of low level pumping, for draining cellars, wheel

ERIE PUMP & ENGINE WORKS

142 Glenwood Avenue
MEDINA, N. Y.

REPRESENTATIVES IN PRINCIPAL CITIES

Products

PUMPS: Boiler Feed, Dredge, Automatic Electric Bilge, Centrifugal, Underwriters', House or Tank, Acid Resistant, Contractors'.

DREDGES: SEWAGE EJECTORS; PUMPING SETS (Stationary, Steam, Gasoline or Motor Driven; Portable, Gasoline Driven); ELECTRIC CELLAR DRAINERS; WATER SUPPLY SYSTEMS; STEAM ENGINES.

Dredge Pumps

Built for hardest service in handling sand and gravel, mine tailings, paper stock, industrial and chemical plant sludges, etc.

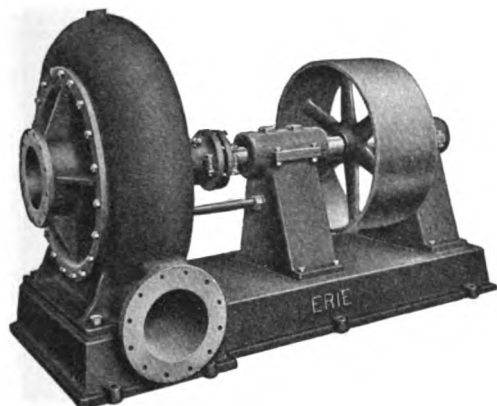


FIG. 227. DREDGE PUMP

Sewage Ejectors

Made in both single (Fig. 293) and duplex types.

Automatic Electric Bilge Pumps

Made in both single and duplex types with open or enclosed type impellers. Ball thrust bearings, one-piece cast iron support pipes and oil flooded steady bearings insure freedom from bearing troubles.

Pumping Sets

Stationary, Steam (Turbine or Engine) Gasoline or Motor Driven—Made in single stage, double suction, horizontally split shell construction (Fig. 257), for total pumping heads up to 200 ft.

Made in multistage horizontally split shell type (Fig. 235), for pressures up to 400 lbs. per sq. in.

Portable, Gasoline Driven—Constructed for direct connection to four-cycle gasoline engines, the entire unit mounted on all-steel truck for emergency pumping by municipalities, public utilities, contractors, etc. Our sand-gravel dredging pumps are also mounted in similar manner for road building purposes.

Centrifugal Pumps

Constructed in single stage, double suction, horizontally split shell type for total heads up to 200 ft. (Fig. 257). For greater pressures, see Fig. 235. Split renewable

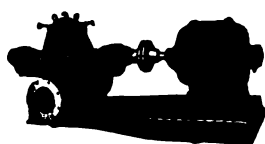


FIG. 257. CENTRIFUGAL PUMP

bearing shells; bronze shaft sleeves, dustproof, leakproof bearings; renewable wearing rings; bronze impellers hydraulically and mechanically balanced. Impeller design prevents overload of driving motor under reduced head.

Boiler Feed Pumps

Made only in the centrifugal horizontally split shell type, 2 to 6 stages. (Fig. 235).

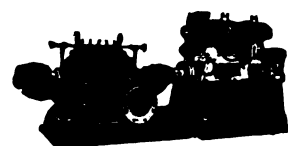


FIG. 235. GASOLINE ENGINE DRIVEN MULTISTAGE PUMP

Fire Protection or Underwriters' Pumps

Made in strict compliance with underwriters' specifications. Furnished without fittings (Fig. 235), or with complete underwriters' fittings.

House or Tank Pumps

Constructed in single suction, single stage type, either open or enclosed type impeller (Fig. 268) for low pressures. For higher pressures, furnished in multistage type (Fig. 235).



FIG. 268. HOUSE OR TANK PUMP

Acid Resistant Pumps

Horizontal and vertical types having all parts in contact with liquid, made from acid resisting alloys. Special designs for coal mine and chemical plant service.

Contractors' Pumps

Fig. 239 shows steam engine driven Class "L" centrifugal pump especially suited for draining excavations, cofferdams, etc.



FIG. 239. CONTRACTORS' PUMP

Electric Cellar Drainers

Furnished in vertical type with capacities from 5 to 100 gals. per minute, adapted for direct connection to either vertical or horizontal motors. Smallest size will discharge up to 20-ft. lift, using 1/4-h.p. motor.

Water Supply Systems

Centrifugal types only for installations with water not more than 20 ft. below ground level. Hydro-pneumatic, storage tank or direct pumping outfits for electric motor gasoline engine drive.

Steam Engines

Vertical A-frame throttling type only up to 12x12 size (Fig. 239). Heavy construction especially suited for dredging and construction work.

FAIRBANKS, MORSE & CO.

Manufacturers
CHICAGO, ILL.

Products

PUMPS: STEAM, POWER, and CENTRIFUGAL.

OIL ENGINES.

Also Fairbanks Scales—all kinds; Air Compressors and Hoists.

For Electric Motors, see page 762.



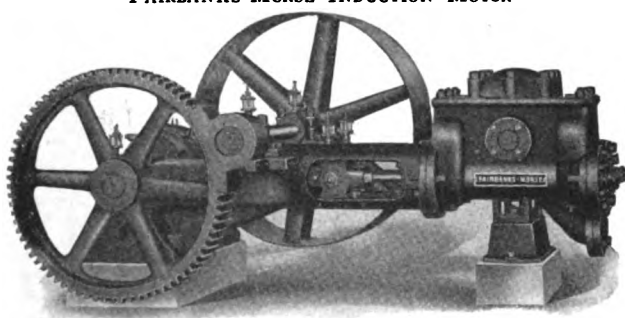
Fairbanks-Morse Pumps

Fairbanks-Morse pump installations are giving continuous service and satisfaction in municipal plants, mines, oil fields, railroads, rice fields, irrigation projects, canneries, bleacheries, smelteries and in manufacturing plants in all sorts of industry.

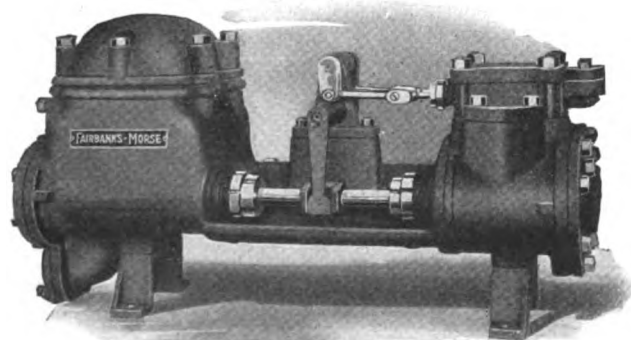
Owing to the wide variety of pumping equipment required to supply the diversified needs of various industries and projects, an attempt has been made to show but a few types, but there is a Fairbanks-Morse pump for practically every kind of work.



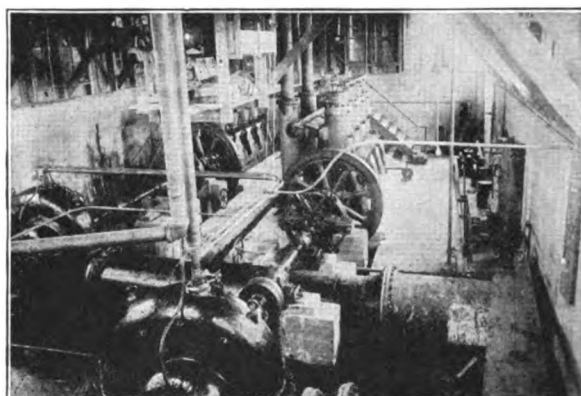
FIG. 1000. 5-INCH, 3-STAGE, HORIZONTALLY SPLIT CASING CENTRIFUGAL PUMP, DIRECT CONNECTED TO 75 H.P. FAIRBANKS-MORSE INDUCTION MOTOR



DUPLEX PISTON PATTERN POWER PUMP



BOILER FEED PUMP, DUPLEX PISTON PATTERN



IRRIGATION PROJECT INSTALLATION, FAIRBANKS-MORSE CENTRIFUGAL PUMPS AND "Y" OIL ENGINES

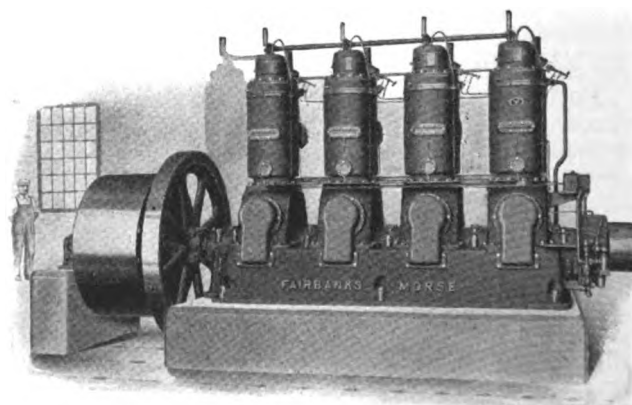
Fairbanks-Morse "Y" Oil Engines

The "Y" oil engine gives unfailing reliable power from a wide variety of low priced fuel oils. This engine operates on the 2-stroke moderately high pressure principle with the fuel injected under pressure in amounts positively governed in proportion to the load. The heat remaining in the combustion chamber, together with that from the compression of the air, ignites the oil, which then burns and creates a pressure which is similar to that in the usual lower pressure internal combustion engines. It operates reliably and continuously on low priced fuel oils.

It is simple, without carburetors, mixers, timers, batteries, electric igniters, spark plugs, magnetos, switches or high pressure air compressors, etc. It is practically automatic in operation.

"Y" oil engines, sizes 10 h.p. to 300 h.p. can be furnished either for belt drive or direct connected to Fairbanks-Morse alternators or generators. Where power for municipal lighting and similar purposes is desired, these latter units are exceptionally well balanced to work together and to give to the user a complete power plant covered by one definite responsibility.

Thousands of "Y" engines are giving continuous satisfaction in the performance of varied work, proving that its many advantages are appreciated and meet with the approval of discriminating engine users.



200 H.P. "Y" OIL ENGINE

THE FREDERICK IRON & STEEL CO.

INCLUDING THE FREDERICK ENGINEERING CO.

Manufacturers of Centrifugal Pumps and Pumping Units
FREDERICK, MD.

DISTRICT OFFICES IN PRINCIPAL CITIES

Products

Specialists in the selection, design and manufacture of CENTRIFUGAL PUMPS and CENTRIFUGAL PUMPING UNITS: Single-stage and Multistage, Single and Double Suction.

Also Steam Jet Ash and Dust Conveyors, Cast Iron Ash Bins and Undercut Gates, Ash Pit Doors and Gray Iron Castings.

Centrifugal Pumps for Practically All Purposes

The development of the Frederick line of centrifugal pumps has resulted in a complete line suitable for practically all services, including:

Sewage	Mine
Drainage	Sugarhouse
Irrigation	Paper mill
Water supply	Filter
City service	Condenser
High pressure fire	Hot well
Heating system	Boiler feeding
Pumps for general service	

Frederick Double Suction Volute Centrifugal Pump (Fig. 1)

Made in sizes up to 30-in. discharge, suitable for operating against heads up to 250 ft.

Can be arranged for direct connection to prime mover or for belt drive.

Frederick Single Suction Split Casing Centrifugal Pump (Fig. 2)

Made in sizes up to 16-in. discharge. Designed especially for the pulp and paper mill industries for handling pulp stocks.

Can be arranged for belt drive or direct connection to prime mover.

Frederick Hydraulically Balanced Centrifugal Pump (Fig. 3)

Made in 4, 6 and 8 stages up to 10-in. discharge for operating against heads up to 1,200 ft.

Designed especially for deep mine service.

Frederick Hydraulically Balanced Centrifugal Pump (Fig. 4)

Made in sizes up to 10-in discharge.

Designed especially for boiler feed or any other high pressure service.

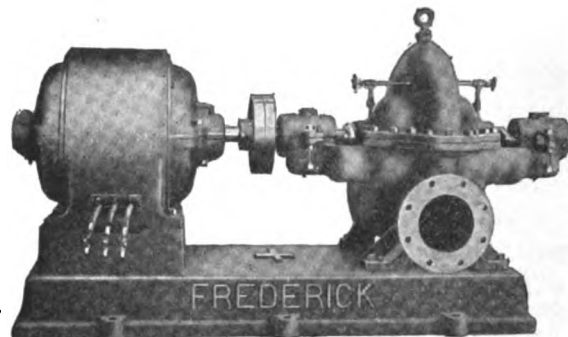


FIG. 1. FREDERICK DOUBLE SUCTION VOLUTE CENTRIFUGAL PUMP, MOTOR DRIVEN

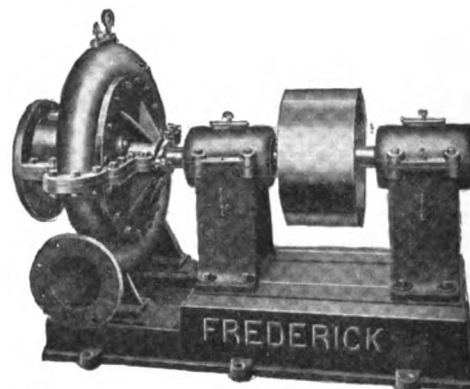


FIG. 2. FREDERICK SINGLE SUCTION SPLIT CASING CENTRIFUGAL PUMP, BELT DRIVEN

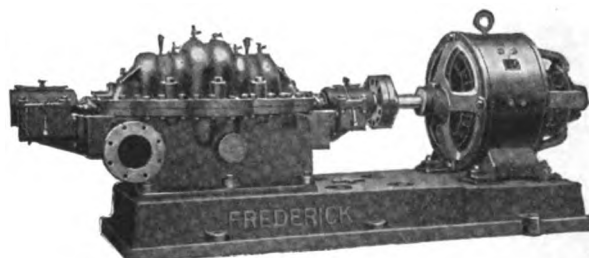


FIG. 3. FREDERICK HYDRAULICALLY BALANCED CENTRIFUGAL PUMP, MOTOR DRIVEN

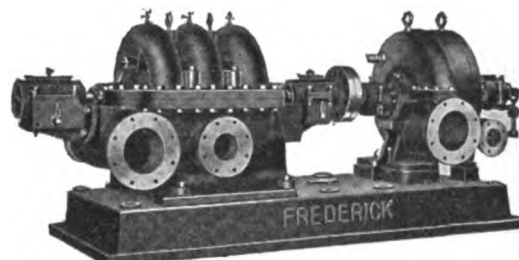


FIG. 4. FREDERICK HYDRAULICALLY BALANCED CENTRIFUGAL PUMP, TURBINE DRIVEN

INGERSOLL-RAND COMPANY

A. S. CAMERON STEAM PUMP WORKS
Manufacturers of Pumping Machinery

GENERAL OFFICES

11 Broadway

NEW YORK, N. Y.

BRANCHES THE WORLD OVER

For List see page 658

Products

CENTRIFUGAL PUMPS, Single and Double Suction Volute, Multi-stage.

DIRECT ACTING STEAM PUMPS.

For Compressors and Drilling Equipment, see pages 658-660.

Cameron Pumps

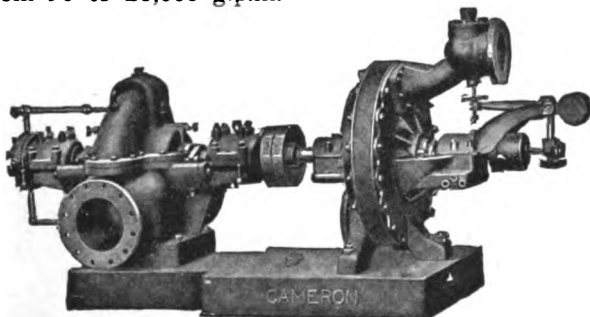
The A. S. Cameron Steam Pump Works have manufactured and sold pumping machinery for over sixty years. Cameron Pumps are now in operation in every quarter of the globe, and everywhere they have earned a reputation for efficient reliability.

Their design is the result of this long, practical experience, their construction is carefully supervised both as to material and workmanship, and before shipment each pump is thoroughly tested for the specified conditions of service for which that particular pump is sold.

Cameron Pumps are built in a great variety of types and sizes. Engineers with experience based on thousands of satisfactory installations, which they have made in the past, are at your service to assist in determining the one pump best suited for the particular requirements.

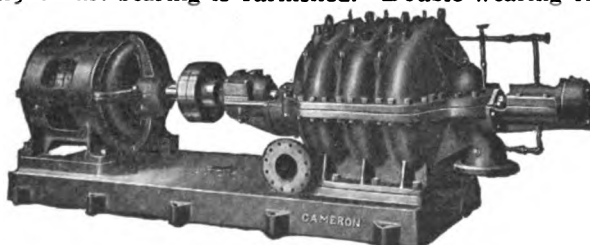
Cameron Centrifugal Double Suction Volute Pumps

These pumps are built in single units for heads up to 230 ft. Arranged in series they are satisfactory for heads as high as 460 ft. Their capacities range from 90 to 20,000 g.p.m.



CENTRIFUGAL PUMP, CLASS "DV"

Cameron double suction volute pumps can be direct connected to electric motor, steam turbine or gasoline engine or can be arranged for belt drive. Casings and bearings are horizontally split to facilitate inspection. Bearings are self-aligning. For low heads or pressures, the double suction feature eliminates necessity for thrust bearings. For higher pressures and heads the Kingsbury thrust bearing is furnished. Double wearing rings



CENTRIFUGAL PUMP, CLASS "MT"



TRADE-MARK

between impeller hub and shaft are replaced from stock and no machining is needed. Bulletin 7350.

Cameron Centrifugal Multi-stage Pumps

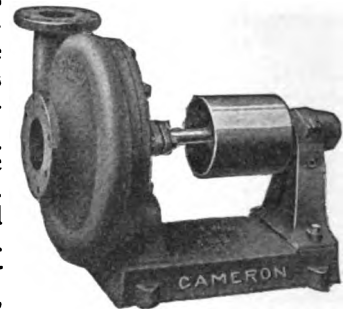
These pumps are built for pumping against heads as high as 1400 ft. They have from 2 to 5 stages in a single casing and up to 10 stages when two pumps are arranged in series. Their capacities range from 125 to 11,000 g.p.m. These pumps are also arranged for any motive power drive.

Standard wearing rings between impeller hubs and shaft keep joints tight and can be replaced from stock without machining. Horizontally split bearings facilitate inspection. Bearings are self-aligning. Either Kingsbury thrust bearing or hydraulic balancing device is furnished. Bulletin 7351.

Cameron Centrifugal Single Suction Volute Pumps

To meet the wide-spread demand for a thoroughly well made and efficient pump that can be purchased at a moderate price we have developed this single suction open impeller pump.

These pumps are built in sizes up to 12 in. for heads up to 70 ft. and for various capacities. They can be furnished for belting to steam engine, gas engine or any other form of prime mover. Bulletin 7252.

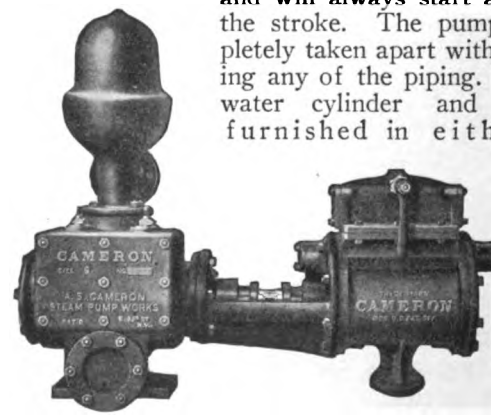


SINGLE SUCTION OPEN IMPELLER PUMP

Cameron Direct Acting Steam Pumps

These pumps range in size from 6- to 20-in. stroke and in capacities from 12 to 610 g.p.m. They are for general service work not requiring too high a suction lift.

This type has fewer working parts than any other steam pump. It has no dead center and will always start at any point of the stroke. The pump can be completely taken apart without disconnecting any of the piping. Water piston, water cylinder and bushing are furnished in either bronze or cast iron.



SINGLE DIRECT ACTING PUMP

Cameron direct acting pumps may be operated by either steam or compressed air. Bulletin 7304.

KEYSTONE DRILLER COMPANY

Manufacturers of "Downie" Pumps, Deep Well and Centrifugal

BEAVER FALLS, PA.

CABLE

"DRILLER, BEAVER FALLS, PA."

BRANCH OFFICES

NEW YORK, N. Y., 170 Broadway

JOPLIN, MO.

CHICAGO, ILL., Monadnock Block

Products

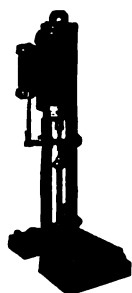
"DOWNIE" DEEP WELL PLUNGER PUMPS, single and double stroke, steam and geared (described in Catalogue No. 6).

"DOWNIE" CENTRIFUGAL PUMPS, single and multistage, horizontal and vertical (described in Bulletin No. 801).

For Excavators see page 45; for Well Drilling Machines, see page 44.

"Downie" Deep Well Pumps

These pumps are built in a great variety of types and sizes to meet every deep well pumping condition



"Downie" Class "B" Single Stroke Steam Pump Head—24-inch Stroke for use with Single Plunger Working Barrels



"Downie" Class "G" Double Stroke Steam Deep Well Pump Head for use with two plunger working barrels



"Downie" Class "A" Double Geared Single Stroke Deep Well Pump Head, belt drive, for use with single plunger working barrels. Can be direct geared to electric motor

where steam or any form of driving power is available. Capacities range from 85,000 gals. per hour using 18-in. dia. working barrel, down to 250-600 gals. per hour using 1¾-in. dia. working barrel. They are designed and constructed according to the highest standards of engineering practice, incorporating only accepted scientific principles of operation, and to obtain the highest degree of efficient, reliable and satisfactory operation



"Downie" Double Stroke Geared Deep Well Pump Head direct geared to electric motor, for use with two plunger working barrels



"Downie" Double Stroke Geared Deep Well Pump Head for heavy duty with two plunger working barrel. Cut shows belt drive type. Can be direct geared to motor or fitted for any other form of drive

with minimum cost of maintenance. The power heads can be furnished with any form of drive—belt, rope, chain, gear, or direct drive—from any type of driver.

"Downie" Single Stroke Deep Well Pumps, Steam and Geared—Are suitable for pumping mod-



erate quantities of water from a given size well, and where power economy is not so important as it is to keep the initial cost of equipment at a minimum for reliable operation. Guaranteed efficiency on "Downie" Single Stroke Pumps—over 55%.

"Downie" Double Stroke Deep Well Pumps, Steam and Geared—Should be used where a maximum quantity of water is wanted from a given size well, and where the highest possible degree of power economy is desired. These pumps produce an absolutely steady flow of water at the pump discharge. The guaranteed efficiency of "Downie" Double Stroke Pumps is over 80%.

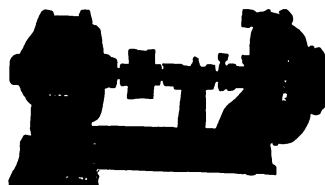
Engineering Service

An Engineering Service Department is maintained by the KEYSTONE DRILLER Co., which is especially prepared to assist in the selection of equipment to fulfill any condition of requirements in the most economical, reliable and satisfactory manner. Those contemplating the installation of deep well pumping equipment are invited to present their problems. This service is free and carries no obligation. In presenting these problems, if the following information is given as far as possible in first communication, it will save time and correspondence:

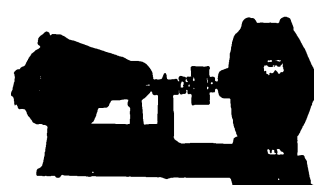
1. Quantity it is desired to pump, per minute, per hour, or per day of so many hours.
2. Pumping depth below ground surface (or mouth of well) when pumping the desired quantity. Note: If unable to give No. 2, state, if possible, the natural standing depth of water below ground surface, and how much it lowered when pumping any given quantity, stating quantity.
3. Vertical lift required above surface (if any), or pressure per sq. in., into pressure tanks or mains.
4. Dia. of well, down to where it is likely necessary to set working barrel, also state total depth of well.
5. State kind of power available and form of drive preferred. Also whether driving power is to be included with pump, and if electric, state voltage if direct current, and cycles and phase and voltage if alternating current.

Centrifugal Pumps

These pumps include a great variety of types and sizes from 1 in. to 15 in. inclusive for capacities ranging

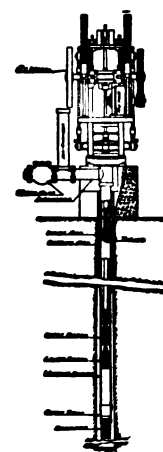


Models "AM" and "BM" Single Stage "Downie" Centrifugal Pump direct connected to motor, for heads up to 125 ft. Sizes 1-inch to 12-inch discharge.



Models "AAM" and "BBM" Two-Stage "Downie" Centrifugal Pump, direct connected to motor, for heads 125 to 250 ft. Sizes 1-inch to 12-inch discharge.

from 15 to 10,000 gals. per minute, and to operate against total heads up to 500 ft. or 215 lbs. pressure. They are particularly noted for their ruggedness, simplicity, and exceptionally high degree of economical operation. They can be furnished with any form of drive—belt, rope, chain, gear, or direct drive—from any type of driver. Guaranteed efficiency of "Downie" Centrifugal Pumps—50% to 80%, varying according to size and operating conditions.



Typical Installation of "Downie" Double Stroke Geared Deep Well Pump, direct geared to motor, showing two plunger working barrels in the well

THE KINNEY MANUFACTURING CO.

Manufacturers of Pumps

3529-3541 Washington Street
BOSTON, MASS.

BRANCH OFFICES

NEW YORK, N. Y.

PHILADELPHIA, PA.
HOUSTON, TEX.

CHICAGO, ILL.

KANSAS CITY, MO.
SAN FRANCISCO, CAL.

Products

ROTATING PLUNGER TYPE STEAM JACKETED PUMPS; TURBINE DRIVEN PUMPS; GASOLINE ENGINE DRIVEN PUMPS; ELECTRICALLY DRIVEN PUMPS; BELT DRIVEN PUMPS; STRAINERS.

For Road Oiling Equipment, see page 63; for Friction Clutch Pulleys and Cut-off Couplings, see page 707.

Brief Description of Kinney Pumps

The Kinney pump is positive and direct in its action both as to suction and discharge. There are only four main working parts, and there are no valves, lobes, gears, internal springs, overhanging valves, intermeshing cogs or other complicated parts which constitute a continual source of trouble, especially in pumping heavy viscous material. Its action is free from pulsation and consequent loss, making it highly efficient both mechanically and volumetrically. It is extensively and successfully used in pumping all grades of heavy viscous material such as molasses, asphalts, heavy Mexican crude oils, glucose, soapstock, as well as the lightest and most volatile liquids.

It may be adapted to any kind of mechanical drive.

The Kinney pump may be furnished in any capacity up to 5000 gals. per minute and for any discharge pressure up to 300 lbs. gage per sq. in. All Kinney pumps will, with the suction blanked off, pull a vacuum on the suction side to within 1 in. of the barometer.

Given below are illustrations and brief descriptions of a few of Kinney types in use today.

Rotating Plunger Type Steam Jacketed Pumps

Kinney rotating plunger type steam jacketed pump (Fig. 191) direct connected by flexible coupling through a turbo type speed reducer to a steam turbine and controlled by emergency pump governor.

Prices on application.

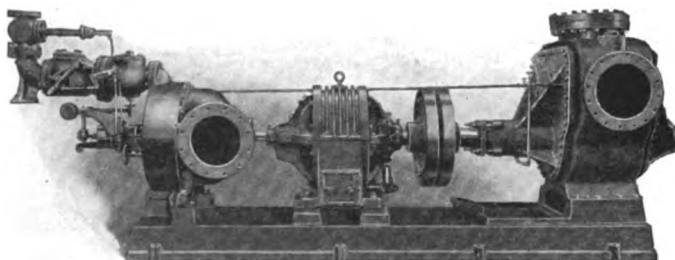


FIG. 191. KINNEY ROTATING PLUNGER TYPE STEAM JACKETED PUMP

Turbine Driven Pumping Unit

The Kinney marine unit (Fig. 181), direct connected to a steam turbine and controlled by an automatic

pressure pump governor. Both pump and turbine are manufactured by THE KINNEY MANUFACTURING CO.

for use in marine work and are designed for fuel oil and lubricating oil. This pump is built in capacities from 10 gals. per minute at 300 lbs. pressure to 45 gals. per minute at 50 lbs. pressure. The unit is very compact, being self-contained. It is fitted with a lantern type of stuffing box which prevents all packing trouble.

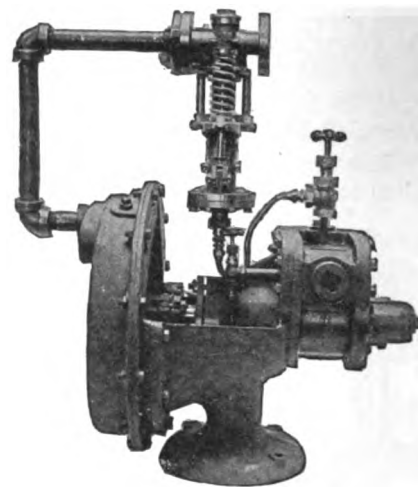


FIG. 181. KINNEY TURBINE DRIVEN PUMPING UNIT

The discharge from this pump is uniform and without pulsation. This feature is of great value in pumping fuel oil to burners for firing marine boilers. Its freedom from pulsation and smooth, uniform delivery insure long life to baffle plates and bridge walls of fire chambers.

The illustration below (Fig. 182) shows another type of Kinney turbine driven pumping unit. A high pressure unit with gear and pinion reduction and pump governor. It is particularly adapted for fuel oil burner systems of any capacity, at a working pressure up to 300 lbs. per sq. in.

Prices on application.

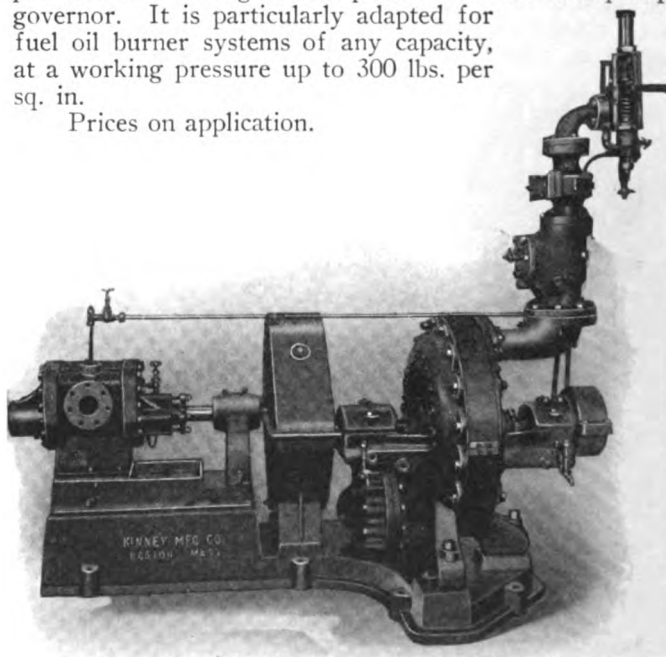


FIG. 182. KINNEY TURBINE DRIVEN PUMPING UNIT

Gasoline Engine Driven Pumping Unit

This gasoline engine driven pump (Fig. 192) is direct connected through gear and pinion and Kinney friction oil bath clutch to a 100 h.p., 6-cylinder gasoline engine.

It is designed for handling heavy crude oil. These units are furnished in any size and capacity and for all kinds of heavy viscous materials as well as lighter fluids.

Prices on application.

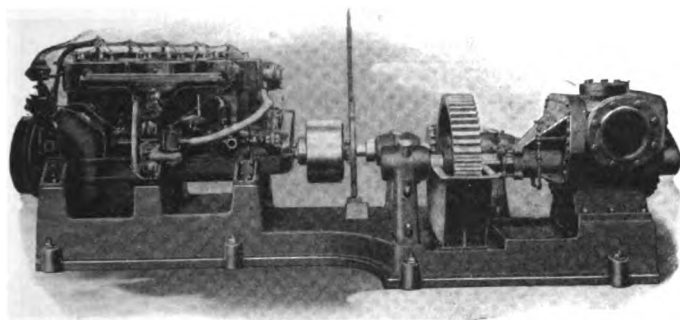


FIG. 192. KINNEY GASOLINE ENGINE DRIVEN PUMPING UNIT

Steam Jacketed Pumping Unit

This type is furnished in any size and capacity. The illustration (Fig. 184) shows the pump connected through flexible coupling to a vertical, all enclosed type of engine with forced lubrication. This unit has the advantage of great flexibility of speed and variation of capacity.

Prices on application.

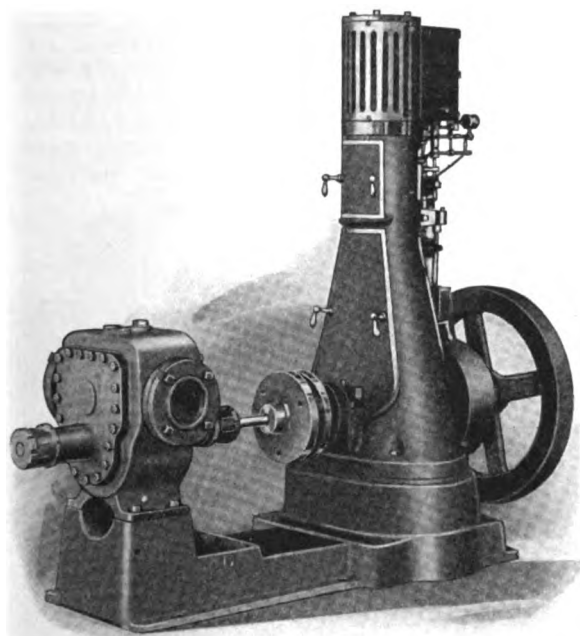


FIG. 184. KINNEY STEAM JACKETED PUMPING UNIT

Electric Driven Pumping Unit

Pump (Fig. 194) is connected to a motor by a silent chain.

It is also furnished gear driven and is adapted for pumping all kinds of heavy viscous materials as well as liquids of a lighter gravity.

Prices on application.

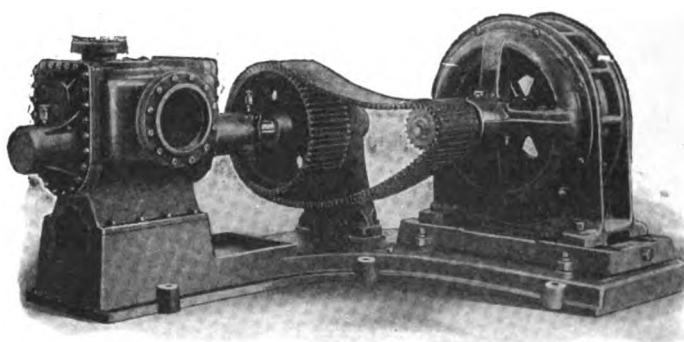


FIG. 194. KINNEY ELECTRIC DRIVEN PUMPING UNIT

Belt Driven Pump with Tight and Loose Pulleys

This type of pump (Fig. 195) is furnished in any size and of any capacity, and is adapted for handling all heavy viscous materials as well as liquids of lighter gravity.

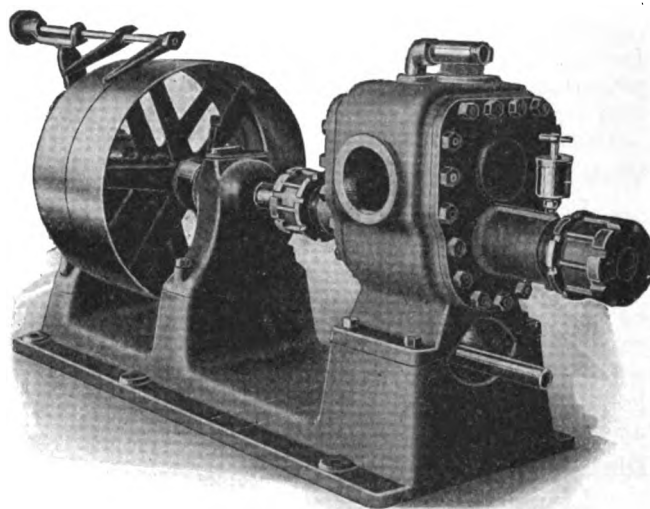


FIG. 195. KINNEY BELT DRIVEN PUMP WITH TIGHT AND LOOSE PULLEYS

Strainers

Both the plain and steam jacketed strainers are furnished in any size. The steam jacketed type is particularly adapted for use in connection with the pumping of heavy viscous materials where heat is required to keep the material in a fluid state.

Strainers are of the basket type. When basket is removed, all insoluble matter is removed with it.

Prices on application.

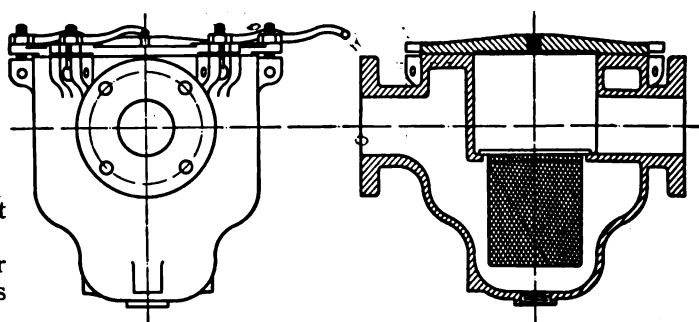


FIG. 164. DETAILS OF KINNEY STRAINER

LAMMERT & MANN CO.

Manufacturers of Rotary Vacuum Pumps; Engineers and Machinists

TELEPHONE
WEST 4918

Wood and Walnut Streets
CHICAGO, ILL.

Products and Services

LAMMERT ROTARY VACUUM PUMPS, Air and Water Cooled for any high, dry vacuum service.

LAMMERT PRESSURE PUMPS, for pressure up to 25 lbs.

Also manufacturers of Water Cooled Rotary Blowers.

ENGINEERS and MACHINISTS.

Lammert Pumps

Lammert rotary dry vacuum and pressure pumps are made in a variety of types and sizes to meet the numerous service requirements, and for any type of power drive: common pulley, tight and loose pulley, clutch, motor equipped, etc.

For the past 20 years LAMMERT & MANN Co. have been making vacuum pumps and some of the largest concerns in America are using them with absolute satisfaction. They have demonstrated by actual on-the-job performance their superior adaptability in meeting the exacting requirements of the work for which they were designed.

Wide Range of Uses

Lammert Vacuum Pumps—Used for canning, preserving, milking, in chemical laboratories and for many varied special purposes where high, dry vacuum is required. They are also adapted to the priming of centrifugal pumps, for which we have our automatic control.

Lammert Pressure Pumps—Used for agitating liquids, positive pressure blowing, for machinestops and any service where pressure up to 25 lbs. can be used.

Distinctive Features

Lammert pumps are dependable, economical and require the absolute minimum of attention. The oiling systems are flawless. The air cooled and small water cooled pumps are equipped



TRADE-MARK

with the capillary type of oiling—oil fed to the bearings and all moving parts by capillary attraction—very economical and efficient. The large pumps are equipped with high duty oiling system which delivers a constant flow of oil to the internal mechanism through the bearings, after which the oil is separated from the exhaust air and returned to the oil chamber to be used over and over again. This feature not only reduces the operating cost, but also cuts the attention required to the minimum.

The smaller pumps may also be equipped with the automatic oiling feature, if desired.

Advantages

There are no valves to stick, no pistons to wear, no cranks or connecting rods to complicate the working parts and consume power. Lammert pumps are simple, compact and require little floor space. They are quiet running without vibration. All parts are standard and interchangeable and each part is rigidly inspected and every pump is tested to its full rated capacity. Every Lammert pump carries a full guarantee against faulty workmanship or material.

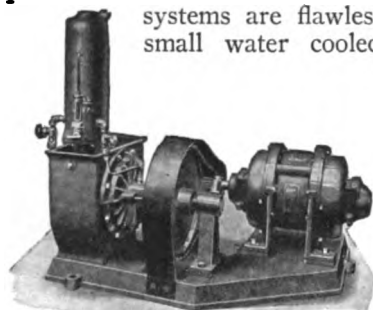
Types and Relative Vacuum Ratings

Lammert pumps may be had air or water cooled, belt or motor driven. The air cooled, single stage pumps are designed for intermittent service and will develop a 27-in. vacuum at sea level. The water cooled, single stage types are for continuous duty and will easily maintain a 27½-in. vacuum, or better, at sea level.

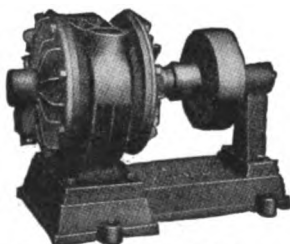
The two-stage, high duty vacuum pumps are guaranteed to maintain a vacuum within ½ in. of the barometer and can be made to do within 1/10 in.

For special requirements various arrangements can be made to accomplish the desired result, such as "unit combination vacuum and pressure," etc.

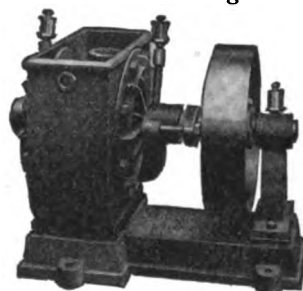
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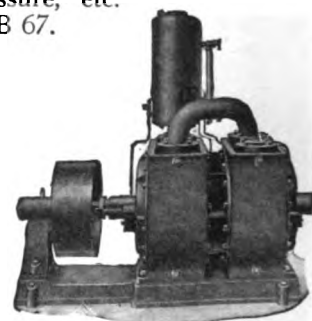
MOTOR DRIVEN, SINGLE STAGE, WATER COOLED, WITH HIGH DUTY OILING SYSTEM
For continuous duty



SINGLE STAGE, AIR COOLED, BELTED TYPE, WITH CAPILLARY OILING SYSTEM
For intermittent service



SINGLE STAGE, WATER COOLED, BELTED TYPE, WITH CAPILLARY OILING SYSTEM
For continuous service



DOUBLE STAGE, WATER COOLED, BELTED TYPE, WITH HIGH DUTY OILING SYSTEM
Highest vacuum

LAMMERT PUMPS

No.	Single stage For 27½ in. vacuum, or better at sea level																Double stage For highest vacuum			
	High duty oiling system							Capillary oiling system									High duty oiling system			
	Water cooled							Air cooled					Water cooled							
	5	5½	6	7	8	9	10	1	2	3	4	1	2	3	4	1A	4A	5½A	6A	
Capacity, cu. ft. per min.....	55	67	90	180	275	425	700	3½	7	14	24½	3½	7	14	24½	3½	24½	67	90	
R. p. m.....	300	300	230	185	150	120	95	500	450	400	350	500	450	400	350	500	350	300	230	
Pulley, in.....	14x4	14x4½	16x6	24x7	28x10	34x12	46x14	4x2	6x2	9x2	10x3	4x2	6x2	9x2	10x3	4x1½	10x3	14x4½	16x6	
Inlet and outlet, pipe size, in.....	2	2	2½	3	3½	4	5	1½	¾	1	1½	1½	¾	1	1½	¾	¾	2	2½	
Horsepower.....	4½	5½	6½	12	18	28	40	¾	¾	1½	2	¾	¾	1½	2	¾	¾	7	9½	
Floor space, in.....	17x28	17x30	22x37	26x48	35x61	43x76	55x97	6x11	10x15	11x17	12x20	6x11	10x15	11x17	12x20	6x14	12x27	17x42	22x50	
Shipping weight, domestic, lbs.....	525	575	1000	1600	3500	6500	10800	26	80	90	170	29	85	100	185	45	245	975	1650	
Shipping weight, export, lbs.....	650	725	1250	1950	3950	7050	11450	36	100	120	200	39	105	130	215	60	280	1200	2000	

THE NASH ENGINEERING COMPANY

PLANT AND GENERAL OFFICES
SOUTH NORWALK, CONN.

SALES OFFICES

BOSTON, MASS., 185 Devonshire Street
BUFFALO, N. Y., 70 West Chippewa Street
CHICAGO, ILL., 1220 Monadnock Block
CLEVELAND, OHIO, 326 Frankfort Avenue,
N. W.
DALLAS, TEX., Dallas Bank Building
DENVER, COLO., Boston Building
DETROIT, MICH., Kerr Building
HOUSTON, TEX., Southern Pacific Building
TORONTO, ONT., Kent Building

INDIANAPOLIS, IND., Hume-Mansur Build-
ing
KANSAS CITY, MO., Mutual Building
LOS ANGELES, CAL., 218 East Third St.
MINNEAPOLIS, MINN., 501 So. Sixth Street
MONTREAL, QUE., 84 Inspector Street
NEW ORLEANS, LA., 521 Baronne Street
NEW YORK, N. Y., 350 Madison Avenue

PHILADELPHIA, PA., Stock Exchange Build-
ing
PORTLAND, ORE., 224 Pine Street
PITTSBURGH, PA., Oliver Building
SALT LAKE CITY, UTAH, Dooly Building
SAN FRANCISCO, CAL., Sharon Building
SEATTLE, WASH., 220 Railway Exchange
ST. LOUIS, MO., Chemical Building
TOLEDO, OHIO, 136 Huron Street
WASHINGTON, D. C., 710 14th Street, N. W.

Products

AIR COMPRESSORS and VACUUM PUMPS.
Also, Acid Pumps (Gas), Condensation
Pumps and Receivers, and Centrifugal Pumps.

Hytor Compressors and Vacuum Pumps

The pumps here described have been built
for over eight years by the NASH ENGINEERING
COMPANY. Principle of operation is shown in
the sectional drawing.

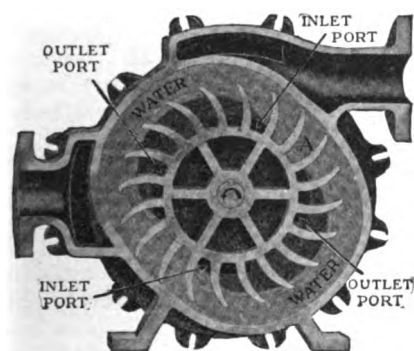
A rotor in hydraulic balance revolves freely with
large clearances, in an elliptical casing filled with water.
The water, turning with the rotor, and constrained to
follow the casing by centrifugal force, alternately recedes
from and is forced back into the rotor, twice in a revolution.
As the water recedes from the rotor it draws in air
through the inlet ports. When the water is forced back
into the rotor by the converging casing, the air is first
compressed and then discharged through the outlet ports.

The air is freed entirely of entrained moisture by
a special separator supplied with each compressor. This
separator is equipped with a ball float valve, which auto-
matically allows the water to escape without loss of air.
The air is thoroughly washed during compression
and contains no oil. In many instances the Nash Hytor

compressor can be
used to do the
work of an air
washer, an air
cooler, and a com-
pressor.

Pressures—

The Nash Hytor
is recommended
for pressure up
to and including
15 lbs. per sq. in.
and for vacuums
not in excess of
20 in. of mercury.



NASH HYTOR COMPRESSOR AND
VACUUM PUMP

CAPACITIES OF NASH HYTOR PUMPS

Standard Pressure			Standard Vacuum		
Size	Speed, r. p. m.	Cu. ft. free air per min. against 10 lbs. pressure	Size	Speed, r. p. m.	Cu. ft. free air per min. at 12 in. (mercury) vacuum
1/2-0	1600	30	1/2-0	1350	25
0	1600	50	0	1350	40
1	1000	90	1	950	90
2	750	200	2	650	180
3	600	340	3	500	300
4	500	450	4	445	440
6	360	935	6	310	900
7	300	1400	7	260	1350
8	230	2250	8	200	2150



TRADE-MARK

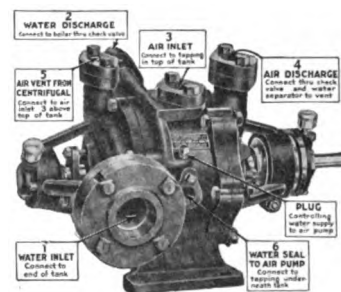
Vacuum Pumps for Return Line Heating Systems

They remove air and water from vacuum
heating systems and automatically return water
to boiler or hot well.

Pump consists of two independent units—a
Hytor turbine air pump and a Jennings centrif-
ugal water pump—combined in one casing. Air
and water are pumped separately, thus the sav-
ing in horsepower is over 50% and cost of current is
reduced proportionately.

Their compact de-
sign permits them to be
installed in one-third the
space necessary for
other apparatus. All in-
terior parts are bronze.
Moving parts revolve
without contact and are
supported on annular
ball bearings mounted
outside of casing. Jen-
nings pumps assure
quiet, reliable operation
without annoyance or
shutdowns and minimum expense for repairs.

Furnished direct connected to standard electric
motors or for belt drive, also with steam turbine drive
designed to operate at a normal steam pressure of 75
lbs. back pressure, but this can be varied. Turbine units
designed to discharge condensate against boiler pressure
not exceeding 20 lbs.



JENNINGS HYTOR VACUUM
PUMP

STANDARD SIZES AND CAPACITIES, JENNINGS HYTOR VACUUM PUMPS

Size	Equivalent direct radiation surface, sq. ft.	Air capacity, cu. ft. per min.	Water capacity, g. p. m., 10 lbs. pressure, 180° F.	Actual h. p.	R. p. m.	H. p. of motor
A	8,000	6	11	.9	1800	1
B	16,000	11	22	1.4	1800	1 1/2
C	26,000	19	35	2.0	1800	2
D	40,000	25	60	2.8	1200	3
E	65,000	42	90	3.9	1200	5
F	100,000	75	140	9.	1200	10
G	150,000	90	200	10.	900	10
H	250,000	180	400	19.	720	20

Bulletins

- No. 15, Jennings Hytor Return Line Vacuum Heating Pumps, Electric Driven
- No. 16, Jennings Hytor Air Line Heating Pumps
- No. 10, Nash Hytor Compressors
- No. 11, Nash Hytor Vacuum Pumps
- No. 17, Jennings Hytor Condensation Pumps
- No. 18, Jennings Hytor Return Line Vacuum Heating Pumps, Steam Turbine Driven
- No. 19, Jennings Sump Pumps

MORRIS MACHINE WORKS

Hydraulic Dredging Machinery and Centrifugal Pumps

MAIN OFFICE AND WORKS
BALDWINSVILLE, N. Y.

BRANCH OFFICES

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BUFFALO, N. Y., ROOT, NEAL & CO.
CLEVELAND, OHIO, CLEVELAND PUMP & SUPPLY CO.
DETROIT, MICH., Penobscot Building
DENVER, COLO., H. W. MOORE & CO.
KANSAS CITY, MO., MERKLE MACHINERY CO.

SALT LAKE CITY, UTAH, F. C. RICHMOND MACHINERY CO.
NEW ORLEANS, LA., JOHN H. MURPHY IRON WORKS
CHARLESTON, S. C., CAMERON & BARKLEY CO.
TAMPA, FLA., CAMERON & BARKLEY CO.
SAN FRANCISCO, CAL., HARRON, RICKARD & McCONE.
LOS ANGELES, CAL., HARRON, RICKARD & McCONE
SEATTLE, WASH., VICKERS & CO.
PORTLAND, ORE., GORDON & FINKHEIMER
ST. PAUL, MINN., ROBINSON, CARY & SANDS
PHILADELPHIA, PA., Real Estate Trust Building
TORONTO, CAN., STOREY PUMP & EQUIPMENT CO.

Products

HYDRAULIC DREDGES; DREDGING PUMPS: Steam, Belt or Electric Motor Driven, Lined or Unlined.

STANDARD CENTRIFUGAL PUMPS for handling Water or Sewage: Belt, Steam, Turbine, Electric or Gasoline Motor Driven; Horizontal or Vertical Shaft; Single Stage or Multistage; Low or High Lift; High or Low Pressure; Horizontal Split.

Also Dredging and Pumping Accessories: Suction Hose; Ejectors; Flap and Foot Valves; Iron Elbows; Suction and Discharge Pipe; Flanges and Increaseers.

Submerged or Side or Double Suction Type, Centrifugal Pumps for handling water or sewage.

Steam Engines: Single Cylinder Stationary and Marine Type; Single Cylinder, Compound, Triple Expansion, Vertical and Horizontal Types.

Special Centrifugal Pumping Outfits can be furnished complete, including driving engine, turbine or motor, or the pump only, adapted to engine or motor furnished by customer.

Experience

During the 58 years devoted to this line of work, Morris experience has covered all services for which centrifugal pumps are used.

Hydraulic Dredging

The hydraulic or suction dredge has been proved to be the most economical in handling sand, gravel, silt, mud, clay, loam, etc.; in fact, all classes of material, except solid rock. It not only dredges the material, but, with one operation, also delivers it to the desired point, and, besides, no other type dredge has the enormous capacity of some hydraulic dredges that are in service. The cost of the dredge, considering its capacity, is less than any other type. Morris dredging pumps have, in the Government dredges on the Mississippi River, handled over 3000 cu. yds. of material per hour.

In operation, the dredging pump creates a partial vacuum in the suction pipe, producing a strong velocity of water in it, sufficient to draw in the material and keep it moving; the pump also produces the pressure necessary to force through the discharge pipe line to distance desired, and at the same time elevates to reasonable height.

Where the sand and gravel lie loose and the suction force of the pump is sufficient to draw it into the pipe without the aid of an agitator, the dredge becomes exceedingly simple. It consists principally of the dredg-



20-INCH DREDGE

ing pump with its driving equipment mounted on a scow; the suction being a pipe of sufficient length to reach to the bottom, with a piece of flexible suction hose in it to give necessary flexibility. The material is delivered into a flat deck scow with raised sides which retain the sand and the water flows back into the river. Sometimes these dredge boats are self-propelling and provided with hoppers into which the material is pumped.

For general dredging service where all classes of material will be handled, it is necessary to use an agitator or cutter to cut and loosen the material before drawing it into the suction pipe. The suction pipe is mounted within a structural steel ladder, of suitable length and of heavy proportion, hinged to the dredge. The cutter is provided with a series of cutting blades and mounted on a powerful shaft supported on the ladder, and driven through gearing from an independent engine. If properly constructed, even shale rock can be dredged.

Naturally the dredge is most efficient when handling the greatest amount of material with the least amount of water. By the use of the rotary cutter and by systematically swinging the dredge and moving forward on the spuds, which are arranged in the stern as anchors, the amount of material fed to the pump can be regulated so that the maximum percentage of material is constantly carried.

Pumps—Dredges are usually equipped with either 12-, 15-, 18-, or 20-in. pumps, the 20-in. having become a standard. The capacity of a pump depends on size, character of material and available power. In average dredging, allowing for delays, the output may be estimated at from 10% to 15%.

The power required to drive the dredging pump depends on the elevation to which the material is to be

raised, the length of delivery pipe, and character of material. For most economical operation the velocity through the pipe line should not be higher than is just necessary to carry the material satisfactorily. The practical maximum discharge pressure is from 45 to 55 lbs. For a long pipe line it is necessary to use relay pumps. As the pump must be built with large openings to pass all classes of material, the efficiency should be largely disregarded.

Engines—15-in. and larger dredging pumps are usually direct connected to compound or triple expansion engines, but can be connected to electric motors. Complete dredges have been built by this company, in which dredging pump, cutter, hoisting engine and all machinery is operated by electricity. An electric dredge requires a smaller working force than a steam dredge.

MORRIS MACHINE WORKS design and build complete dredges, including pump and driving engine, the hull and all machinery required, for steam or electricity.

Dredging Pumps

Belt Driven—This standard pump is the result of years of manufacturing dredging pumps and is very heavy and strong for average service. The pump shell is in one very heavy casting, with extra metal in parts most subject to wear. A removable disc is fitted to the suction side of the shell, giving easy access to the interior or for the removal of the impeller. The impeller is of large size for moderate speed, with ample space between it and pump shell so that stones can not get wedged in.

Adjustable stuffing box bearing is of large size, fitted with water injection to keep sand out. Extra

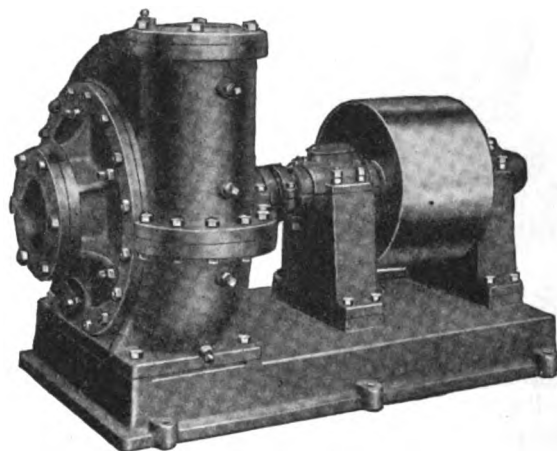
heavy frame and shaft pillow block have ample bearing surface. Pumps are regularly furnished with suction and discharge elbows, flap valve and ejector for priming. Prices cover bare pump less above extras.

Steam Driven—Standard dredging pumps are also furnished direct connected to single and double vertical simple engines. They are largely used by contractors in pumping out excavations, etc., on account of their ability of passing large solids.

Solid Lined Dredging Pumps (Patented)

This pump was designed for handling tailings or slimes in connection with gold recovery plants. A number are in use in this and foreign countries, and hundreds in South Africa. It has also found extensive use for ordinary dredging.

These pumps are now built in sizes from 2- to 12-in. discharge. Lining is made of manganese steel, or hard cast iron, and makes practically an independent pump enclosed within a cast iron casing. Everything is of heavy proportions; the shaft is large, the bearings of a special type, the stuffing box made to reduce the wear to the smallest possible extent.



SOLID LINED DREDGING PUMP (PATENTED)

Pump No. (diam. discharge opening, in.)	H. p. for each ft. head	Nominal capacity, gals. per min.	Diam. and face of pulley, in.	Floor space, in.	Shipping weight, lbs.	Price manganese steel lined
2	0.1	120	8x8	46x20	625	\$263.00
3	0.22	270	10x10	47x27	1050	417.00
4	0.35	475	12x10	48x29	1150	457.00
5	0.5	750	14x10	59x33	2000	639.00
6	0.68	1030	14x12	60x38	2400	820.00
7	0.86	1450	18x14	74x44	3500	1022.00
8	1.2	2000	20x14	75x47	4700	1277.00
10	1.9	3000	22x16	84x50	5500	1532.00
10	1.9	3000	24x16	90x60	7000	2076.00
12	2.5	4200	24x16	92x63	9400	2498.00

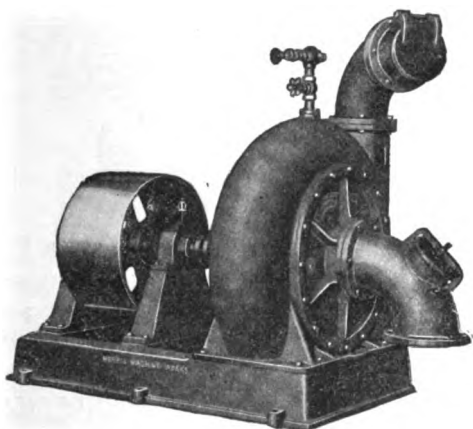
Pump No. (diam. discharge opening, in.)	Price cast iron lined	Revolutions per minute for given heads					
		10 ft.	20 ft.	30 ft.	40 ft.	50 ft.	60 ft.
2	\$ 206.00	505	715	875	1005	1125	1230
3	323.00	400	570	700	805	910	985
4	339.00	435	610	745	865	970	1055
5	485.00	400	570	700	805	910	985
6	577.00	340	475	580	670	750	815
7	729.00	320	450	545	635	710	775
8	939.00	290	410	500	575	640	700
10	1061.00	315	445	540	630	705	770
10	1455.00	240	340	415	480	540	590
12	1687.00	220	315	380	440	400	540

Prices are for pumps, and do not include elbows, valves, or ejector. Horsepower and speeds are for total head, i. e., actual elevation plus friction head in piping and fittings.

Single pumps should not be used for heads higher than 60 ft. For higher heads, use 2-stage pumps. Prices on application.

For 10-in. pump, 2 patterns; one for high speed and one for low speed as preferred.

These pumps also built with tight and loose pulleys, or with base extended for direct connection to motor.



NEW SPECIAL HYDRAULIC SAND AND DREDGING PUMP

Pump No. (diam. discharge opening, in.)	Diam. suction, in.	Cu. yds. material per hour, 10% of solids	H. p. re- quired for each 10 ft. ele- vation	Will pass solids, diam., in.
4	4	14	4	2
6	6	31	8	4½
8	8	56	15	6
10	10	87	25	8
12	12	125	30	10
15	15	195	50	10

Pump No. (diam. discharge opening, in.)	Diam. and face of pulley, in.	Floor space required, in.	Shipping weight, lbs.	Price of pump with suction and discharge elbow, flap- valve and ejector	Price extra for steel lining
4	12x12	40x31	980	\$ 254.00	\$43.50
6	20x12	68x40	2125	494.00	92.00
8	24x14	72x48	3670	750.00	141.00
10	30x15	94x54	4975	1066.00	226.00
12	36x20	114x66	7825	1542.00	302.00
15	42x24	154x78	15200	2875.00	.....

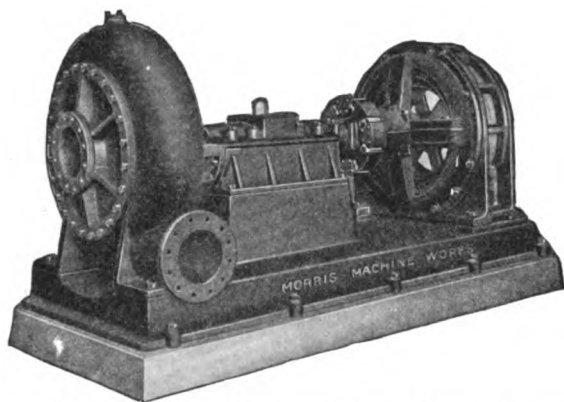
These pumps should run at rated speeds; or for forced work, speeds can be increased by from 10% to 25%.

Adjustments are made from the outside. There are no bolts or screws in the lining. No wear can come on the outer pump case, as it is completely protected by the lining. By removing the upper half of the pump shell, the lining can be taken out; or by removing the disc on the pump shell and the inner disc on the lining, the runner, of enclosed type, can be taken out.

The first cost, owing to its construction and extremely heavy proportions, is comparatively high; but when compared to its lasting qualities it will be found economical in operation.

Heavy Duty Sand and Gravel Pumps

Designed for severe service and increased output. The double enclosed thrust bearing operating in oil eliminates troublesome thrust. The shell is extra heavy at points of wear. Stuffing box is arranged for water circulation. This type is also built for belt drive and direct connected to steam engine.



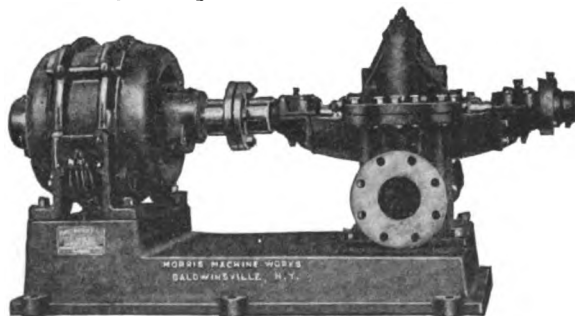
10-INCH HEAVY SERVICE DREDGING PUMP DIRECT CONNECTED TO 125 H.P. ELECTRIC MOTOR

Horizontally Split, Double Suction and Multistage Pumps

Single Stage—This type of pump is especially adapted for high efficiency and for operating at high speed for direct connection to electric motor or turbine. It is also built for belt drive. Suction and discharge openings are in the bottom half of shell, therefore top can be removed without disconnecting them.

Brief specifications are: bronze enclosed impeller, bronze sleeved steel shaft, removable babbitted bearing shells, ball bearing flexible coupling, bronze stuffing box glands.

Built in sizes 2 to 20 in. Also built of acid resisting bronze for operating in acidulous water.



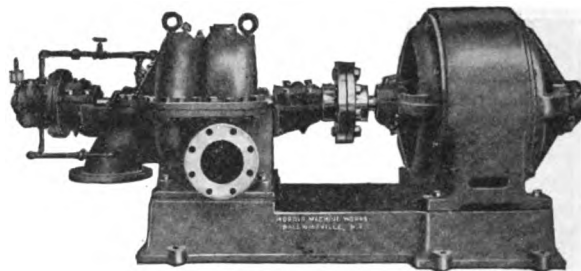
HORIZONTALLY SPLIT, DOUBLE SUCTION PUMP

Multistage—Where the head is too high for the double suction pump this company builds a multistage pump.

This type is designed along the same lines as the single stage double suction type, except that, being side

suction, it develops an end thrust. This thrust is taken care of by a water cooled marine type bearing running in oil. Leakage between stages is prevented by bronze labyrinth rings.

Built in sizes 2 to 14 in. Number of stages depending on the head. Also built of acid resisting bronze for operating in acidulous water.

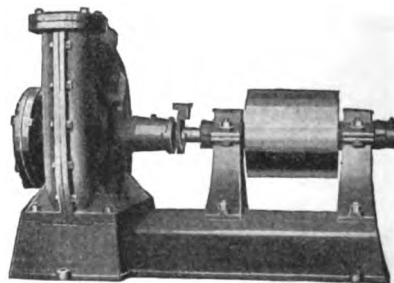


HORIZONTALLY SPLIT, MULTISTAGE PUMP

Morris Improved Standard Belt Driven Horizontal Pumps

The horizontal pump is the type most extensively used for all purposes. It is of iron construction.

The pump is intended for all classes of service where a strong, substantial pump, able to take care of itself with the least of attention, is required. The pump shell is mounted directly on the base; a substantial bearing on each side of the pulley is lined with babbit; the steel shaft is of large diameter; the stuffing



IMPROVED STANDARD HORIZONTAL RIGHT-HAND PUMP

box bearing is long and babbit lined; the box is deep and arranged with gland. All parts are accurately machine fitted. Pump is furnished complete with oilers, and with or without primer.

MORRIS IMPROVED STANDARD IRON HORIZONTAL PUMP

Pump No. (diam. discharge opening, in.)	Size pipe flange on suction, in.	Economical capacity, gals. per min.	H. p. re- quired for each ft. elevation	Diam. and face of pulley, in.	Floor space required in.
1	1 1/4	30	.0625	4x 3 1/4	12x17
1 1/2	2	70	.058	6x 6	17x31
1 3/4	2	90	.075	7x 8	21x32
2	3	120	.10	8x 8	23x37
2 1/2	3	180	.15	8x 8	24x38
3	4	260	.22	8x 8	25x39
4	5	470	.30	10x10	29x41
5	6	735	.45	12x12	34x54
6	8	1050	.59	15x12	37x55
8	10	2000	1.00	20x12	45x64
10	12	3000	1.52	24x12	51x69
12	15	4200	2.00	30x14	63x71

Pump No. (diam. discharge opening, in.)	Shipping weight lbs.	Price	Price extra if brass fitted
1	85	\$30.00	\$ 9.00
1 1/2	175	45.00	12.00
1 3/4	260	60.00	15.00
2	350	75.00	18.00
2 1/2	360	90.00	22.00
3	415	110.00	25.00
4	615	130.00	40.00
5	940	165.00	60.00
6	1180	200.00	90.00
8	2065	310.00	130.00
10	2610	395.00	165.00
12	3615	500.00	275.00

Morris Reciprocating Engine Driven Centrifugal Pumps

Centrifugal pumps direct connected to steam engines are self-contained, take up but little space and make the most economical pumping unit. This company builds the engines, simple, compound or triple expansion, especially designed for direct connection to centrifugal pumps.

MORRIS MACHINE WORKS have a large variety of patterns for all sizes of pumps, so that for most reasonable heads direct connected pumps can be furnished that will not have to run at excessive speeds.

The side suction pump is intended for general service, and is largely used in pumping out excavations, etc.

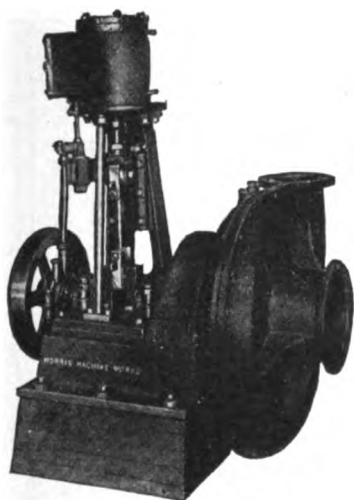
Determination of Right- or Left-Hand Pumps

When standing at the pump and looking over pump shell towards pulley or driver, if the top of shaft revolves from right to left, or anticlockwise, the pump is right hand; and if from left to right, or clockwise, it is left hand.

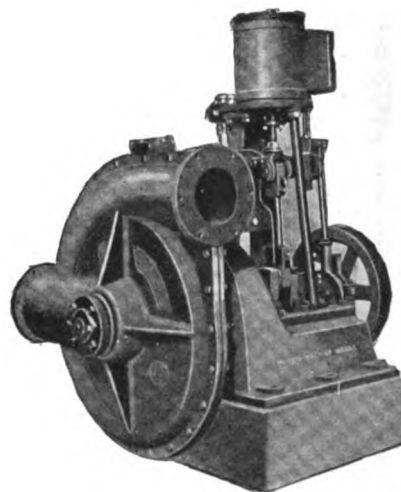
Information Required for Estimates or Ordering

The following information should be given as completely as possible, to enable this company to promptly make recommendations and submit estimates:

- (1) Number of pumps required.
- (2) Capacity of pump in gallons per minute.
- (3) Kind of liquid to be handled.
- (4) What is total pumping head, including suction and discharge?
- (5) What is suction head?
- (6) What is discharge head?
- (7) What is length of suction and discharge piping, and size (if determined); also number and degree of elbows?
- (8) Is vertical or horizontal type of pump desired?
- (9) How will the pump be driven? Give full description of driver.
- (10) State position of suction and discharge preferred and direction of rotation.



STANDARD SIDE SUCTION STEAM PUMP



STANDARD DOUBLE SUCTION STEAM PUMP

MORRIS STEAM PUMPS

Pump No. (diameter discharge opening, in.)	Economical capacity, gals. per min.	Suitable for elevations up to, ft.	Size steam cylinder, in.		Size steam pipe, in.	Size exhaust pipe, in.	Weight, lbs.	
			Diam.	Stroke			Side suction	Double suction
2	120	25	3	3	1 1/4	1	500	560
2 1/2	180	25	3	3	1 1/4	1	510	585
3	260	25	3	3	1 1/4	1	545	550
4	470	25	4	4	1 1/4	1	925	1070
4	470	25	5	5	1	1 1/4	1150	1275
5	735	25	5	5	1	1 1/4	1175	1325
6	1050	30	5	5	1	1 1/4	1325	1525
6	1050	30	6	6	1 1/4	1 1/2	1480	1675
7	1400	25	5	5	1	1 1/4	1400	1600
8	2000	20	6	6	1 1/4	1 1/2	2150	2360
8	2000	25	7	7	1 1/2	2	2450	2660
8	2000	30	8	8	1 1/2	2 1/2	2650	2875
10	3000	10	6	6	1 1/2	2 1/2	2800	3440
10	3000	15	7	7	1 1/2	2 1/2	3000	3640
10	3000	20	8	8	1 1/2	2 1/2	3100	3760
10	3000	25	9	9	2	3	4475	5100
10	3000	30	10	10	2 1/2	3	4650	5290
10†	3000	40	12	10	2 1/2	3	7200	8700
12	4200	20	9	9	2	3	4600	5500
12	4200	25	10	10	2 1/2	3	5750	6650
12	4200	30	12	10	2 1/2	3	6300	7200
12†	4200	40	14	12	3	3 1/2	9000	10000
15	7000	30	14	14	3	4	13100	14600
15*	7000	22	12	10	2 1/2	3	6700	7500
18	10000	30	15	16	4	5	15000	16600
18*	10000	20	12	12	3	3 1/2	8500	9500
20	12000	20	14	14	3	4	12800	14300

*Low lift pumps. †Special high lift pumps. Quotations on larger sizes or on special combinations on application. Any steam pump with compound engines directly connected can be furnished. Prices for double and side suction iron pumps on application.

RUMSEY PUMP COMPANY, LTD.

109 Johnson Street
SENECA FALLS, N. Y.

Products

POWER PUMPS for every pumping service, driven by belt, chain, gear or direct drive, including HYDRAULIC PRESSURE PUMPS; SINGLE and DOUBLE ACTING TRIPLEX PUMPS; ELECTRIC TRIPLEX PUMPS; DOUBLE ACTING POWER PUMPS; CENTRIFUGAL PUMPS; ROTARY POWER PUMPS; DEEP WELL PUMPING OUTFITS and WATER WORKS MACHINERY.

Also manufacturers of Trench Pumps, Hydraulic Rams, Hand Pumps of all kinds, Diaphragm Pumps, House Pumps, Hand and Windmill Well Pumps, Spray Pumps, etc.; Pneumatic Water Systems, Hydrants, Foot and Check Valves, Cylinders and Pump Accessories.

Complete electric, gas or gasoline pumping units may be furnished.

Catalogues

General catalogue of Hand and Power Pumps, 57th edition, a complete reference book of pumping machinery; Catalogue A, Pneumatic Water Systems; Catalogue B, Triplex Power Pump; Catalogue C, Selected Hand Pumps; Catalogue DC, Rotary Pumps. Booklets on Centrifugal, Spray and Deep Well Pumps.

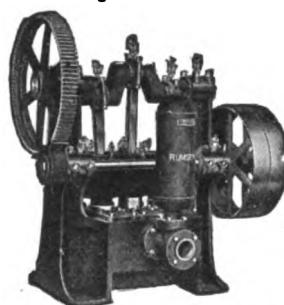
Triplex Pumps

The design is simple and compact, with all working parts accessible for inspection or adjustment. All parts are made from the best materials. Only skilled workmen are employed for founding, machining and assembling. All pumps are rated at conservative speeds. The result is an article suitable for durable, practical service. These pumps are offered in a wide range of styles and sizes for any pumping application: For general water supply and fire protection; municipal water works; boiler feeding, circulating, mine pumping; hydraulic elevators; exerting pressures; pumping special liquids, chemicals, etc. Construction details necessarily vary according to the service for which pumps are rated or special conditions under which they are to operate. Detailed specifications of any pump will be sent on request.

Cranks are of the best cast or forged steel, of proper weight to take the heaviest strain to which they are subject. Bearings are of ample size, of bronze or lined with best babbitt scraped to a true surface. Gearing is machine cut from solid. Waterways are large and direct. Valve areas are correctly proportioned. Glands are arranged to keep the plunger packing tight with a very slight pressure on the studs, preventing undue friction. All pumps are equipped with suitable oiling devices and drips.

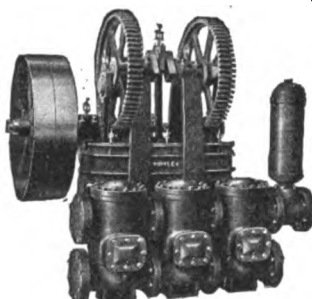


TRADE-MARK



SINGLE GEARED TRIPLEX PUMP

Small sizes, light service

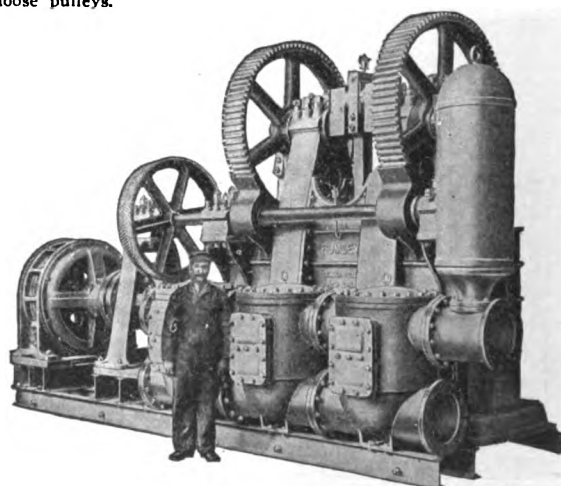


DOUBLE GEARED TRIPLEX PUMP, STANDARD TYPE, 500-GAL. GENERAL SERVICE PUMP

STANDARD SIZES AND CAPACITIES, MODERATE PRESSURE, SINGLE ACTING TRIPLEX PLUNGER PUMPS

Capacity at moderate speed, gals. per min.	Working pressure, lbs.	Figure No.	Plungers diameter x stroke, in.	Displacement per rev., gals.	Pipes, in.		Standard pulleys, in.	Code word
					Suction	Discharge		
1.5	150	681	1 1/4 x 2	0.03	1	3/4	12x 1 1/2	Cabbage
1.5	200	684	1 1/4 x 2	0.03	1	3/4	12x 1 1/2	Conclave
3.5	200	684	1 1/2 x 3	0.07	1	1	12x 2	Conclude
4.5	150	681	1 1/2 x 3	0.09	1	1	12x 2	Cab
6	130	681	2 x 3	0.12	1 1/4	1 1/4	12x 2	Cabajal
8	200	684	2 x 4	0.16	1 1/4	1 1/4	12x 2 1/2	Concoct
10	150	681	2 1/4 x 4	0.20	1 1/4	1 1/4	12x 2 1/2	Cabal
13	150	681	2 1/2 x 4	0.25	1 1/4	1 1/4	12x 2 1/2	Cabaret
14	200	684	2 1/2 x 4 1/2	0.28	1 1/2	1 1/2	15x 2 1/2	Concord
20	150	681	3 x 4 1/2	0.41	1 1/2	1 1/2	15x 2 1/2	Cabin
25	150	681	3 1/2 x 4 1/2	0.50	1 1/2	1 1/2	15x 2 1/2	Cablet
25	200	684	3 x 5	0.46	1 1/2	1 1/2	20x 3	Concur
30	150	681	3 1/2 x 5	0.62	2	2	20x 3	Cabob
35	200	684	3 1/2 x 6	0.75	2	2	20x 4	Concuss
50	150	681	4 x 6	1.00	2 1/2	2 1/2	20x 4	Caboose
60	120	681	4 1/2 x 6	1.24	3	2 1/2	20x 4	Caboosoon
75	150	681	5 x 6	1.53	3	3	24x 5	Cabotage
90	120	681	5 1/2 x 6	1.85	3	3	24x 5	Caburn
100	85	692	5 x 8	2.00	3 1/2	3 1/2	24x 4	Coping
100	150	691	5 x 8	2.00	3 1/2	3	30x 5	Communism
100	200	698	5 x 8	2.00	3 1/2	3	30x 6	Coterie
125	150	692	5 1/2 x 8	2.46	3 1/2	3	30x 5	Copse
125	125	691	5 1/2 x 8	2.46	3 1/2	3	30x 5	Comet
125	165	698	5 1/2 x 8	2.46	3 1/2	3	30x 6	Cotgrave
150	55	692	6 x 8	2.93	4	3 1/2	24x 4	Coquette
150	100	691	6 x 8	2.93	4	3 1/2	30x 5	Commuter
150	140	698	6 x 8	2.93	4	3 1/2	30x 6	Cotia
175	43	692	6 1/2 x 8	3.44	4	4	24x 4	Coquina
175	85	691	6 1/2 x 8	3.44	4	4	30x 5	Comose
175	120	698	6 1/2 x 8	3.44	4	4	30x 6	Cotolin
215	85	692	6 1/2 x 10	4.30	5	4	30x 6	Cordovan
215	150	691	6 1/2 x 10	4.30	5	4	36x 6	Compact
215	200	698	6 1/2 x 10	4.30	5	4	42x 6	Cotswold
250	195	690	7 x 10	5.00	5	5	42x 6	Comprint
270	75	692	7 1/2 x 10	5.35	6	5	30x 6	Cormorant
270	125	691	7 1/2 x 10	5.35	6	5	36x 6	Combining
270	160	698	7 1/2 x 10	5.35	6	5	42x 6	Cotta
325	55	692	8 x 10	6.50	6	5	30x 6	Coronet
325	100	691	8 x 10	6.50	6	5	36x 6	Combative
325	130	698	8 x 10	6.50	6	5	42x 6	Cottage
345	150	690	8 1/2 x 10	6.94	6	5	42x 6	Compart
415	125	690	9 x 10	8.26	7	6	44x 6	Compass
415	150	690	9 x 10	8.26	7	6	42x 10*	Compeer
445	185	690	9 x 12	9.91	8	8	44x 6	Compile
510	100	690	10 x 10	10.20	8	8	44x 6	Complex
510	150	690	10 x 10	10.20	8	8	42x 10*	Compose
550	150	690	10 x 12	12.24	8	8	48x 10*	Compress
560	85	690	10 1/2 x 10	11.25	8	8	44x 6	Compotal
560	135	690	10 1/2 x 10	11.25	8	8	42x 10*	Compotete
570	215	788	10 x 14	14.28	8	8	60x 14†	Corrigent
605	135	690	10 1/2 x 12	13.50	8	8	48x 10*	Compret
690	90	789	11 x 14	17.28	12	10	60x 10*	Corposant
690	175	788	11 x 14	17.28	12	10	60x 14†	Corrifon
820	75	789	12 x 14	20.56	12	10	60x 14†	Corposant
820	150	788	12 x 14	20.56	12	10	60x 14†	Corral
965	65	789	13 x 14	24.12	12	10	60x 10*	Corpulent
965	130	788	13 x 14	24.12	12	10	60x 14†	Correlate
1,120	55	789	14 x 14	27.98	12	10	60x 10*	Corpuscle
1,120	110	788	14 x 14	27.98	12	10	60x 14†	Corridor
1,120	200	798	14 x 16	32.00	12	10	72x 20†	Corvette
1,460	150	798	16 x 16	41.77	14	12	72x 20†	Corvine
1,650	130	798	17 x 16	47.16	14	12	72x 20†	Corylus
1,850	110	798	18 x 16	52.85	14	12	72x 20†	Corymb

*Single pulley. †Single pulley for double belt. Other sizes have tight and loose pulleys.



ELECTRIC TRIPLEX PUMP WITH GEAR DRIVE
Type of water works pump—2,000,000-gal. unit

Each Rumsey triplex pump is carefully tested to its maximum working service before shipment and is fully guaranteed.

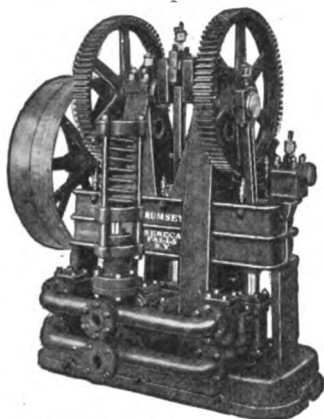
The design of our triplex pumps permits of considerable alteration from standard construction to meet special service or working conditions. Pumps are regularly fitted for handling cold water, but will be equipped for hot water without extra charge. For other alterations a slight margin above cost will be added.

Any pump may be furnished with vacuum chamber, rawhide pinion, by-pass, etc., or arranged on bed plate or foundation for connection to driving power.

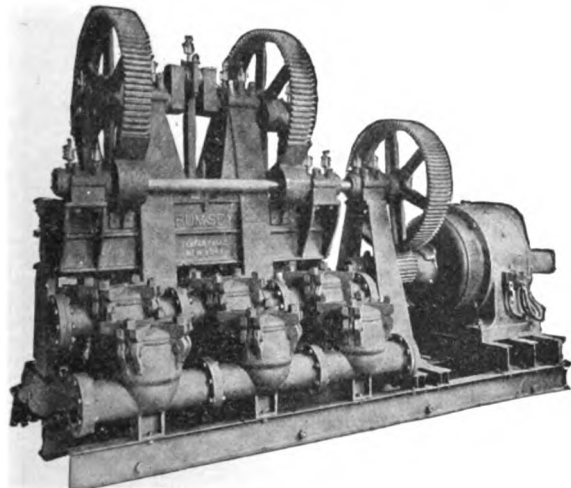
Single acting triplex pumps may be brass fitted to order when not regularly so equipped; and when construction limits permit, with brass covered or bronze plungers, brass lined or bronze glands and bronze bushed cylinders. Double acting triplex pumps may be brass fitted to order, with removable brass lined iron cylinders or removable bronze cylinders, iron pistons with brass followers or bronze pistons, or bronze piston rods.

Directions for Inquiries—It will facilitate correspondence if clients, in asking for recommendations and prices, will furnish the following information:

- (1) For what purpose the pump is to be used.
 - (2) Quantity of liquid to be pumped per minute.
 - (3) Whether service is constant or intermittent, and the average number of hours per day pump will run.
 - (4) Height to which liquid is to be raised by suction, and diameter and length of suction pipe.
 - (5) Height in feet or pressure in pounds against which liquid has to be forced, also diameter and length of discharge pipe.
 - (6) Nature of liquid to be pumped, whether hot or cold, salt or fresh, acid, clear or gritty.
 - (7) Power available for driving pump.
- If a deep well pump is required, give information covered by items 1, 2, 3, 6 and 7 above. Also:
- (8) Total elevation between surface of the water and discharge point; and diameter and length of discharge pipe.
 - (9) Diameter and depth of well or pit, and distance from surface of ground to low water level.
 - (10) Vertical distance that the cylinder will be placed above low water level if not actually submerged at all times.



HYDRAULIC PRESSURE PUMP
WITH SPRING ALLEVIATOR



ELECTRIC TRIPLEX PUMP FOR HEAVY DUTY
This stationary mine pump replaced three relays of centrifugals

(11) A sketch showing relative position of supply, pump and discharge point, with dimensions, and giving length, size and turns or bends of pipe lines, will be a great aid to a thorough understanding of conditions under which pump is to operate.

Double Acting Power Pumps

Reliable pumps for tank pumping and general use where an inexpensive outfit is desired. Made with brass lined cylinder, leather packed piston, metal valves, large air chamber and back gearing.

These pumps are offered in capacities of from 4 to 65 gals. per minute. Illustration shows a 2x3-in. pump; larger sizes differ in design.

Geared or belted electric outfits can be furnished complete with, or ready to receive, electric motor.

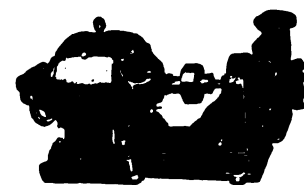
Geared engine outfits complete with engine are offered in several sizes.



DOUBLE ACTING PUMP

Low Lift Centrifugal Pumps

Rumsey centrifugals are offered in both horizontal and vertical types and in sizes from 1 to 10 in., capacities 10 to 2400 gals. per minute for heads not more than 100 ft. Pumps for contractors, industrial plants, mines and quarries, for circulating, handling thick liquids and chemicals and many special applications. Direct connected electric sump pumps and horizontal pumps, and direct connected and geared gasoline pumping sets can be supplied.



ELECTRIC CENTRIFUGAL
PUMP

Rotary Power Pumps

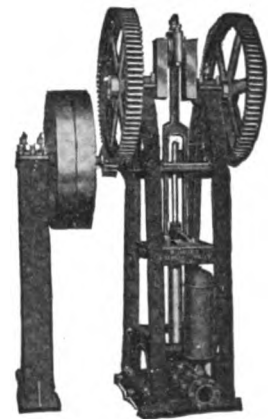
Rotaries are used with economy by thousands of manufacturers for handling liquids such as oils, acids and other chemicals. For water supply, they are popular because of their low cost and large capacity. For fire protection, rotaries are most dependable, throwing a continuous stream with a uniform strain on pump and driving power. Built in capacities to discharge up to four standard fire streams and arranged for hose or for piping to hydrants or sprinkler system.



SMALL TYPE OF ROTARY
POWER PUMP

Deep Well Pumping Sets

The selection of equipment for raising water from deep wells is most important. Strength in the machine must be combined with accessibility of working parts, as the strain is severe and adjustments and repairs are expensive and difficult. Rumsey deep well working heads are correctly designed to give dependable, lasting service. Offered in a range of styles suitable for wells of any depth for operating Rumsey single or double acting cylinders.



DEEP WELL WORKING HEAD
Style for deep artesian wells

TABER PUMP COMPANY

295 Elm Street
BUFFALO, N. Y.

Products

PUMPS: Centrifugal, Sump and Rotary.

Taber Centrifugal Pumps, Type SV

These pumps are made up in single-stage units only. They are of the double suction volute type with split casing.

Bronze fitted throughout; all parts are interchangeable.

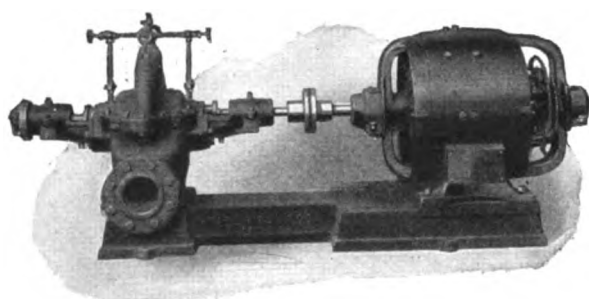
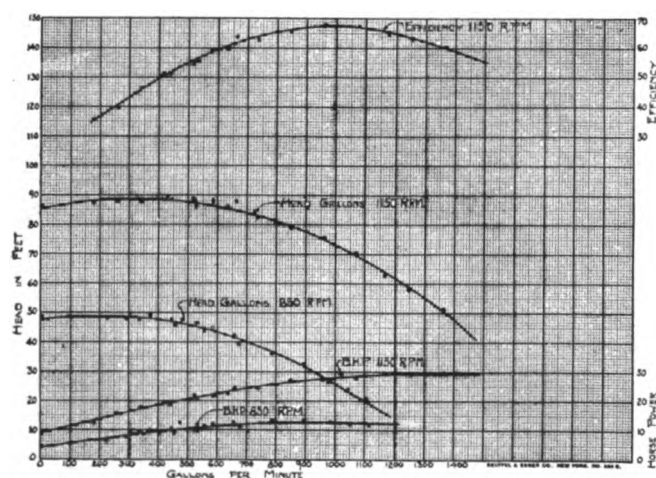


FIG. 503. TYPE SV CENTRIFUGAL PUMP

Type SV pumps can be furnished for either belt or motor drive, in capacities ranging from 100 to 1200 gals. per minute.

Fully described in Bulletin 30.



EFFICIENCY CURVE, TYPE SV PUMP

Taber Centrifugal Pumps, Type V

These pumps are extensively used for circulating water and other fluids. When constructed of bronze, they are particularly suitable for circulating corrosive liquids, such as tanning liquors and brine for refrigeration purposes.

Type V centrifugal pumps are carefully designed single suction open impeller type pumps. While they are usually demanded for belt drive, they can be fitted to any prime mover—the most popular arrangement being the electric motor driven centrifugal pumping unit.

Fully described in Bulletin 20.

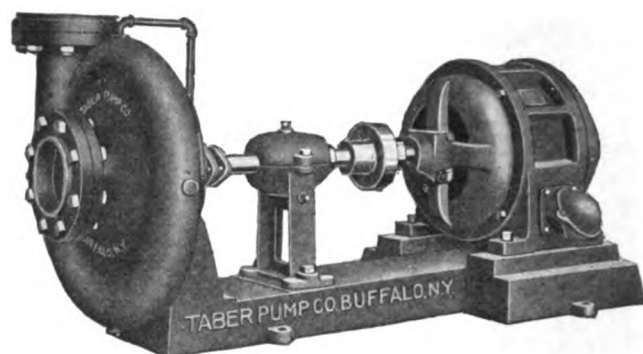


FIG. 190. TYPE V CENTRIFUGAL PUMP FOR MOTOR DRIVE

TABER TYPE V PUMPS

Pump No.	Section, in.	Discharge, in.	Nominal capacity, gals. per min.	H. P. per ft. head	Head in feet									
					10	20	30	40	50	60	70	80	90	100
V-1	1 1/4	1	30	.035	1425	1800	2075	2300	2490					
V-2	1 1/2	1 1/4	50	.040	1200	1450	1640	1800	1990					
V-3	2	1 1/2	100	.075	905	1175	1360	1535	1680	1810	1950	2075	2175	2275
V-4	2 1/2	2	150	.085	800	980	1135	1255	1400	1490	1600	1715	1800	1880
V-5	3	2 1/2	200	.105	730	900	1050	1200	1275	1410	1500	1600	1675	1760
V-6	4	3	300	.140	550	725	850	940	1040	1135	1210	1300	1360	1435
V-7	5	4	400	.280	560	680	800	880	965	1040	1120	1175	1240	1300
V-8	6	5	900	.460	570	675	810	860	925	1000	1070	1125	1190	1250
V-9	8	6	1200	.550	510	615	680	780	860	925	995	1050	1120	1165

MOST EFFICIENT HEADS, SPEEDS AND CAPACITIES

Pump No.		Head in feet									
		10	20	30	40	50	60	70	80	90	100
V-1	G. p. m.	17	24	29	33	37					
	R. p. m.	1150	1680	2050	2340	2600					
V-2	G. p. m.	23	32	40	46	50	55	60	65		
	R. p. m.	875	1240	1500	1775	2000	2200	2325	2440		
V-3	G. p. m.	55	75	92	108	122	132	140	155		
	R. p. m.	800	1100	1350	1600	1750	1940	2080	2220		
V-4	G. p. m.	88	120	150	170	190	210	225	240	255	270
	R. p. m.	700	940	1150	1300	1450	1565	1740	1790	1910	2025
V-5	G. p. m.	125	158	183	205	220	240	250	265	275	290
	R. p. m.	625	790	1050	1210	1325	1450	1550	1660	1750	1830
V-6	G. p. m.	170	225	270	305	350	380	410	435	460	485
	R. p. m.	475	670	840	960	1055	1160	1265	1345	1420	1500
V-7	G. p. m.	350	450	520	575	620	665	700	735	770	800
	R. p. m.	450	640	770	875	970	1060	1145	1200	1295	1370
V-8	G. p. m.	475	650	775	890	975	1050	1150	1200	1250	1350
	R. p. m.	450	615	745	860	955	1025	1100	1175	1250	1320
V-9	G. p. m.	800	1025	1200	1350	1475	1600	1700	1800	1875	1950
	R. p. m.	440	575	680	800	885	980	1055	1140	1190	1225

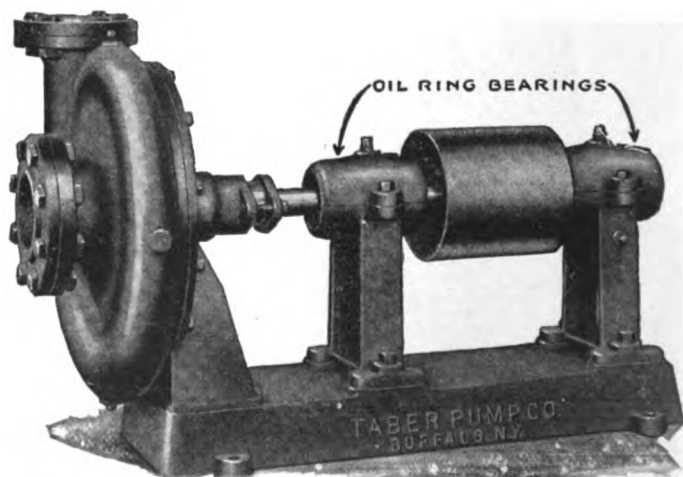


FIG. 192. TYPE V CENTRIFUGAL PUMP FOR BELT DRIVE

Taber Sump Pumps

Fig. 194 illustrates the Taber high grade sump pump. These pumps are fitted with ball bearing thrust. Can be supplied with automatic starting and stopping device. Ratings are the same as those of Type V pumps listed on the preceding page.

Fully described in Bulletin 20.



FIG. 194. SUMP PUMP

Taber Rotary Pumps, Type T

These pumps are particularly suitable for handling viscous materials, such as soap stock, asphalt, paints, molasses or any other products of this nature, there being a design for each specific requirement.

Made for belt, motor or engine drive. Constructed of iron or bronze.

Fully described in Bulletin 22.

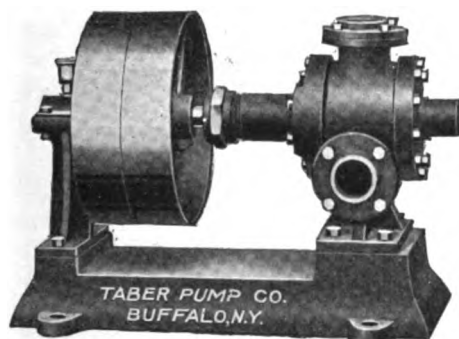


FIG. 146. TYPE T BELT DRIVEN CIRCULATING PUMP

Taber Rotary Pumps, Type G

These pumps are suitable for handling various kinds of liquids including oils, chemical solutions and water, and are made in iron and bronze.

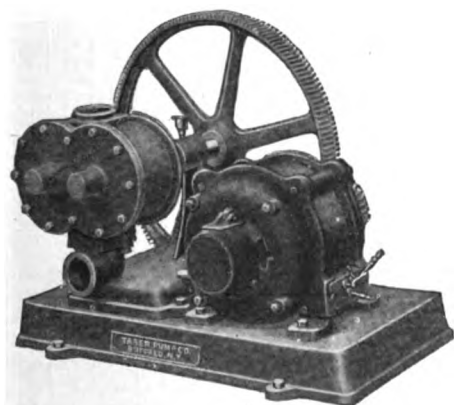


FIG. 179. TYPE G MOTOR DRIVEN ROTARY GEAR PUMP

These pumps are built in several sizes for belt drive or for motor drive (Fig. 179).

They are carefully machined and gears are finished over all. Accessibility to inlet and outlet connections is a desirable feature.

Fully described in Bulletin 25.

TABER TYPE G PUMPS

R. p. m.	Capacity, gals. per min.			
	No. 1	No. 2	No. 3	No. 4
100	4	14	32	40
150	7.25	22	52	64
200	13	32	67	84
250	16	45	86	104
Suction, in.	1	1 1/2	2	2 1/2
Discharge, in.	1	1 1/2	2	2 1/2
Pulleys, in.	8 x 2 1/4	10 x 2 1/4	12 x 3 1/4	17 1/2 x 3 1/4
Weight, lbs.	55	75	140	210

Taber Rotary Pumps, Type S

These pumps are made particularly for handling gasoline and oils. They are very close fitted and are of the 4-bucket type.

The distinctive advantage of this type of pump for handling light liquids is that the buckets are hydraulically balanced and self-compensating, a new patented feature.

Pumps operate smoothly, and have wonderful suction properties, delivering efficiently against a 100-ft. head.

These pumps are of special interest to oil refineries. They are made for either belt, gasoline engine or electric motor drive, and where conditions require air chamber and low pressure relief valve, these can be furnished.

Fully described in Bulletin 31.

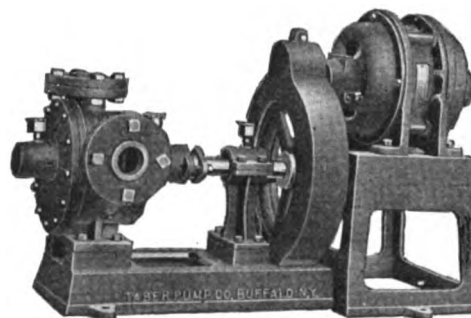


FIG. 300A. TYPE S MOTOR DRIVEN ROTARY PUMP

TYPE S ROTARY PUMPS*

Suction, in.	Discharge, in.	R. p. m.	Capacity, gals. per min.	Head, ft.	H. p.	Pulleys, tight and loose, in.	Key No.	H. p. motor	Approximate floor space, in.		Approximate shipping weight, lbs.	
									Belt	Motor	Belt	Motor
1	1	350	10	15 25	1/4 1/2	6 1 1/4	98	1/2 and 3/4	8 x 15	14 x 25	50	55
1 1/4	1 1/4	250	20	10 50 30	1/2 1 1/4 1	8 x 2 1/4	41	1 and 1 1/2	9 x 20	14 x 28	75	125
1 1/2	1 1/2	250	50	30 50	1 1/2 2	10 x 2 1/4	47	2 and 3	10 x 24	19 x 36	125	185
2	2	200	75	35 60	3 5	12 x 3 1/4	99	3 and 5	18 x 30	20 x 39	275	360
3	3	200	100	50	5	18 x 4 1/2	91	5 and 7 1/2	18 x 38	24 x 48	460	540
4	4	200	200	75	10	24 x 6	112	7 1/2 and 10	24 x 48	21 x 56	825	750

*Above ratings are normal and practically cover average conditions. It is recommended that the details of specific problems be referred to this company so that the best equipment can be recommended for specific requirements.

WORTHINGTON PUMP AND MACHINERY CORPORATION

115 Broadway
NEW YORK, N. Y.
BRANCH OFFICES

ATLANTA, GA., 435 Trust Company of Georgia Building
BIRMINGHAM, ALA., American Trust & Savings Bank Building
BOSTON, MASS., 465 Massachusetts Trust Building
BUFFALO, N. Y., 707 Iroquois Building
CHICAGO, ILL., 820 Old Colony Building
CINCINNATI, OHIO, 1503 First National Bank Building
CLEVELAND, OHIO, 304 Kirby Building
DENVER, COLO., 435 Seventeenth Street
DETROIT, MICH., 839 Majestic Building
EL PASO, TEX., 510 Mills Building
HOUSTON, TEX., 425 Southern Pacific Building
KANSAS CITY, MO., 825 Scarritt Building
LOS ANGELES, CAL., 209-210 Higgins Building

MEXICO CITY, MEX., P. O. Box 5260
NEW ORLEANS, LA., 533 Baronne Street
PARIS, FRANCE, 1 Rue des Italiens
PHILADELPHIA, PA., 1516 North American Building
PITTSBURGH, PA., 407 Oliver Building
ST. LOUIS, MO., 701 Laclede Gas Building
ST. PAUL, MINN., 613 Merchants' National Bank Building
SALT LAKE CITY, UTAH, 113 W. Second South Street
SAN FRANCISCO, CAL., 306 Sharon Building
SEATTLE, WASH., 203 Maynard Building
TULSA, OKLA., 123 West First Street
WASHINGTON, D. C., 426 Homer Building
LONDON, ENG., Queen's House, Kingsway

Products

PUMPS and PUMPING EQUIPMENT: all types for every conceivable service, including Steam Pumps; Steam, Oil Engine, Gas Engine, Belt, Motor and Turbine Driven Centrifugal Pumps; High Economy Pumping Engines of every type (flywheel, centrifugal or direct acting) for waterworks, sewage, irrigation or other service requiring the economical pumping of large quantities of water by steam, electricity, gas or oil.

CONDENSERS: Surface, Jet, Barometric and Ejector.
FEED WATER HEATERS.

METERS: Water, Oil and Gasoline.

COMPRESSORS: Air, Gas and Ammonia.

VACUUM PUMPS.

ENGINES: Heavy Oil, Kerosene, Diesel and Gas.

HYDRAULIC TURBINES and WATER WHEELS.

FILTER and TANKAGE PRESSES.

MINING and CEMENT MACHINERY: Gyratory and Jaw Crushers; Ball, Tube, Rod and Stamp Mills; Rolls; Jigs; Screens; Log Washers; Elevators and Conveyors; Converters and Blast Furnaces.

Also, Sand Riddlers, Core Wire Straighteners, Steam Accumulators, Oil Mill Machinery, Oil Burner Pumping Units.

Catalogues

Catalogues describing any of the equipment listed herein will be sent on application.

Facilities and Services

The facilities of nine factories, each specializing in its particular group of products and the accumulated experience of over 81 years of successful manufacturing are at the disposal of Worthington clients. These factories are:

Worthington Works, Harrison, N. J.
Blake & Knowles Works, East Cambridge, Mass.
Deane Works, Holyoke, Mass.
Power & Mining Machinery Works, Cudahy, Wis.
Laidlaw Works, Cincinnati, Ohio
Snow-Holly Works, Buffalo, N. Y.
Hazleton Works, Hazleton, Pa.
Gas Engine Works, Cudahy, Wis.
Epping-Carpenter Works, Pittsburgh, Pa.

Located in the principal manufacturing districts of the United States, they afford unusual facilities for the prompt shipment of pumping machinery and power auxiliaries. The Worthington policy—that of manufacturing every type in each of its lines of power equipment—enables the purchaser to choose from a wide range of equipment just the right type to suit the particular conditions of his installation.

WORTHINGTON Duplex Packed Piston Pumps

Standard for all ordinary services

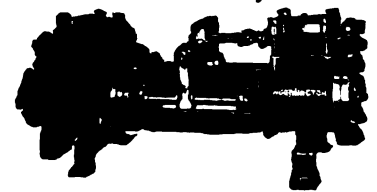


TRADE-MARK

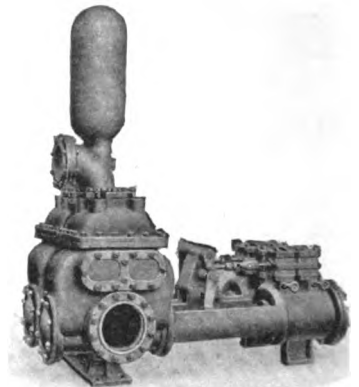
where
t h e

water pressures are not in excess of 200 lbs. per sq. in.

These pumps are suitable for boiler feeding, tank supply, hydraulic elevators, small water works service and general water supply purposes. They are accessible in every part and are fitted for pumping hot or cold, thick or thin, heavy or light, acid or alkaline liquids as may be required. Where high steam economy is of paramount importance, they are supplied with compound steam cylinders.



CAP AND VALVE PLATE PATTERN
DUPLEX PACKED PISTON PUMP



TURRET TOP PATTERN DUPLEX
PACKED PISTON PUMP

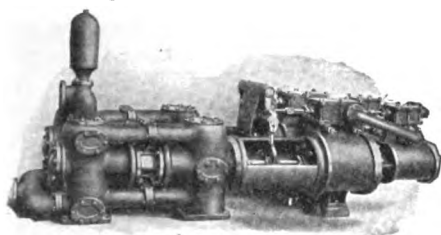
DUPLEX PACKED PISTON PUMPS

Maximum working pressure: steam ends, 150 lbs.; water ends, up to 10 x 6 x 10, 200 lbs.; larger size water ends, 150 lbs.

Size, in.			Gals. per stroke each piston	Normal operating capacity per min.			Diameter pipes, in.				Floor space, in.
Cylinder diameter		Stroke		Number single strokes	Piston speed, ft.	Gals.	Steam	Exhaust	Suction	Discharge	
Steam	Water										
3	2	3	.041	110	28	9	1 1/4	1 1/4	1 1/4	1	24x 9
3 1/2	2 1/4	4	.069	100	33	14	1 1/4	1 1/4	1 1/4	1 1/4	28x 9
4 1/2	2 3/4	4	.103	100	33	21	1 1/4	1 1/4	1 1/4	1 1/4	33x13
5 1/4	3 1/2	5	.208	90	38	37	1 1/4	1 1/4	2 1/2	1 1/2	38x16
6	4	6	.326	80	40	52	1 1/4	1 1/4	3	2	44x17
7 1/2	5	6	.51	80	40	82	1 1/4	2	4	3	45x22
7 1/2	4 1/2	10	.69	70	58	97	1 1/4	2	4	3	59x22
9	5 1/4	10	.94	70	58	131	2	2 1/2	4	3	61x23
10	6	10	1.22	70	58	171	2	2 1/2	5	4	62x26
10	7	10	1.67	70	58	234	2	2 1/2	6	5	60x26
12	7	12	2.00	60	60	240	2	2 1/2	6	6	76x31
14	7	12	2.00	60	60	240	2 1/2	3	6	6	78x33
12	8 1/2	12	2.95	60	60	354	2	2 1/2	6	6	76x31
14	8 1/2	12	2.95	60	60	354	2 1/2	3	6	6	78x33
16	8 1/2	12	2.95	60	60	354	2 1/2	3	6	6	79x40
14	10 1/4	12	4.29	60	60	515	2 1/2	3	8	7	82x37
16	10 1/4	12	4.29	60	60	515	2 1/2	3	8	7	82x40

Outside Packed Plunger Pumps

Designed for rough and heavy service, for working pressures of 140 to 250 lbs. per sq. in.



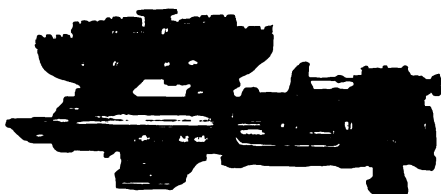
COMPOUND PACKED PRESSURE PUMP
Scranton pattern; 250 lbs. pressure

They are completely accessible and can be furnished to handle up to 5650 gals. per minute.

Pot Valve Pressure Pumps

Designed for high pressure boiler feeding and other services requiring high water pressure. Pumps of this type are furnished for pressures up to 2000 lbs. per sq. in., suitable for steel and rolling mills in connection with hydraulic presses and for high-lift elevator work.

Where economy of power is important, compound steam cylinders are employed.



PRESSURE PATTERN BOILER FEED PUMP

Worthington builds a forged water end pump for pressures from 2000 to 12,000 lbs. per sq. in.

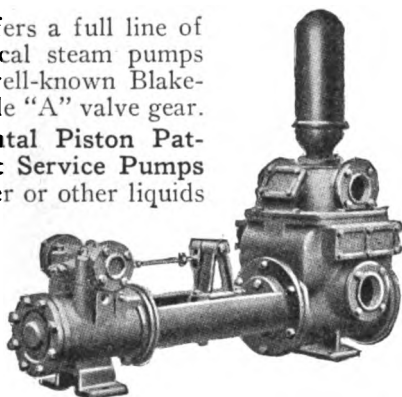
Special pumps available for any service.

Simplex Pumps

Worthington offers a full line of horizontal and vertical steam pumps equipped with the well-known Blake-Knowles simplex style "A" valve gear.

Single Horizontal Piston Pattern Tank or Light Service Pumps

For pumping water or other liquids to limited heights, these pumps combine large pumping capacity with small expenditure of steam, the steam cylinders in proportion to the pump cylinders be-



SINGLE HORIZONTAL PISTON PATTERN
TANK OR LIGHT SERVICE PUMP

PISTON PATTERN TANK OR LIGHT SERVICE PUMPS

Maximum working pressure: steam end, 250 lbs.; water end, 8 in. and under in diam., 100 lbs.; larger sizes, 75 lbs.

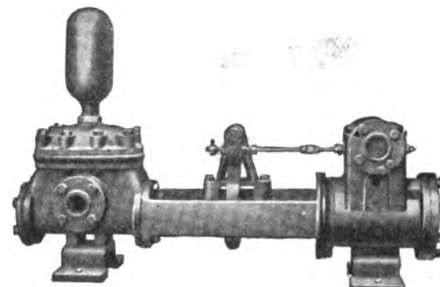
Size, in.		Normal operating capacity per min.			Diameter pipes, in.				
Cylinder diameter									
Steam	Water	Stroke	Gals. per stroke	Number single strokes	Piston speed, ft.	Gals.	Steam	Exhaust	Discharge
3 1/2	3 1/2	4	.17	100	33	17	3/8	1/2	1 1/2
4 1/2	4 1/2	4	.35	80	40	28	1/2	3/4	2 1/2
5 1/2	5 1/2	4	.72	75	44	54	3/4	1 1/4	3 1/2
6 1/2	6 1/2	4	1.47	60	58	88	1 1/4	2 1/4	4 1/2
7 1/2	7 1/2	4	1.67	70	58	117	1 1/2	2 3/4	5 1/2
8	8	4	2.61	60	60	157	1 3/4	3 1/4	6 1/2
10	10	4	4.08	60	60	245	2 1/4	4 1/4	8 1/2
10	10	4	6.12	60	90	367	2 1/2	5 1/4	9 1/2
10	12	4	5.87	60	60	352	1 1/2	3 1/2	6 1/2
10	12	4	8.81	60	90	528	1 1/2	3 1/2	6 1/2
12	12	4	5.87	60	60	352	1 1/2	3 1/2	6 1/2
12	12	4	8.81	60	90	528	1 1/2	3 1/2	6 1/2
14	14	4	12.00	60	90	720	2 1/2	4 1/2	8 1/2
14	14	4	15.66	60	90	940	2 1/2	4 1/2	8 1/2
16	16	4	15.66	60	90	940	2 1/2	4 1/2	8 1/2

ing smaller in diameter than with the regular pressure pumps.

Worthington has patterns for intermediate and larger sizes and can furnish pumps with different combinations of steam and water cylinders adapted exactly to individual conditions.

Single Horizontal Piston Pattern Boiler Feed or Pressure Pumps

Simple, compact, accessible and durable machines, having large direct water passages and full valve areas, which reduce water friction to a minimum and particularly adapt the pumps to boiler feeding. All parts are interchangeable.



SINGLE HORIZONTAL BOILER FEED OR
PRESSURE PISTON PUMP

PISTON PATTERN BOILER FEED OR PRESSURE PUMPS

Maximum working pressure: steam end, 250 lbs.; water end, 250 lbs.

Size, in.		Normal operating capacity per min.			Diameter pipes, in.				
Cylinder diameter									
Steam	Water	Stroke	Gals. per stroke	Number single strokes	Piston speed, ft.	Gals.	H. P. boiler (at 35-lb. evap.) pump will feed at 65% normal space	Steam	Exhaust
3 1/2	2 1/4	4	.069	100	33	7	64	3/8	1/2
4 1/2	2 3/4	4	.15	80	40	12	110	1/2	3/4
5 1/2	3 1/4	4	.25	75	44	19	175	3/4	1 1/4
6 1/2	3 3/4	4	.46	70	47	32	300	1 1/4	2 1/4
7 1/2	4 1/4	4	.69	70	58	48	450	1 1/2	2 3/4
8	5	4	1.02	60	60	61	570	1 3/4	3 1/4
10	6	4	1.47	60	60	88	820	2 1/4	4 1/4
12	7	4	2.00	60	60	120	1115	2 1/2	5 1/4
14	8	4	2.61	60	60	157	1450	3 1/4	6 1/4
16	10	4	6.12	60	90	367	3400	4 1/2	8 1/4

Vertical Simplex Piston Pumps

Made with single or double steam and water cylinders in a large range of sizes and capacities suitable for boiler feeding, general pressure or tank service. They are especially adapted for use where floor space is restricted, a valuable feature in marine service.

Volute Centrifugal Pumps

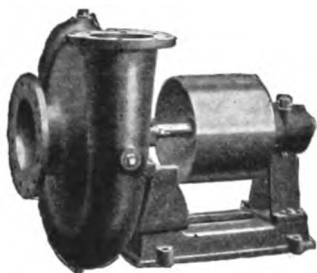
Because of the wide range of designs, Worthington is enabled to meet the preference of any customer and to furnish a pump best suited for his conditions of service. Following are indicated a few of the main types of volute pumps, the line of which runs from the 1-in. Class "C" volute to the 72-in. double suction volute.

These pumps may be used for a variety of purposes: for waterworks service; sewage pumping plants; dry dock pumps; irrigation and drainage service; circulating water for condensers; paper mills; sugar factories; pumping brine, light oils, mine water, acidulous water, slimes, etc. They can be arranged for direct drive from steam turbines and engines, oil engines and electric motors, also for belt drive.



VERTICAL SIM-
PLEX PISTON
PUMP VALVE
POT TYPE

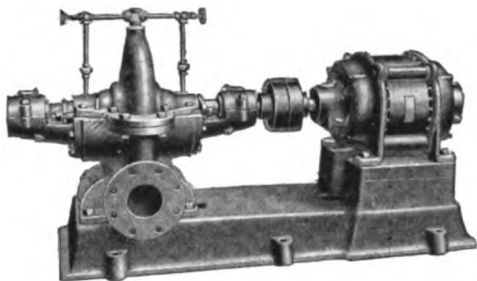
Class "C" Volute Pumps—For all around service where small and medium quantities of water are to be pumped against heads not exceeding 80 ft. Handle gritty and sandy water, and are especially adapted for building contractors' work, also in connection with water supply from driven wells. These are standard pumps for all temporary and intermittent service, as first cost of installation will be lower than with any other pumping outfit.



CLASS "C" VOLUTE PUMP FOR BELT DRIVE

CLASS "C" VOLUTE PUMPS

Size, in.	Gals. per min.	Approximate h. p. required	Maximum head, ft.
1	10 to 42	.5 to 2.5	40
1½	20 to 82	.75 to 4.5	50
2	38 to 185	1.0 to 11.0	60
2½	53 to 258	1.0 to 17.5	80
3	75 to 362	1.0 to 18.0	80
4	125 to 585	1.5 to 30.0	80
5	224 to 1020	2.0 to 44.0	80
6	332 to 1820	3.0 to 75.0	80
8	434 to 2860	3.5 to 110.0	80
10	780 to 4400	5.5 to 148.0	80



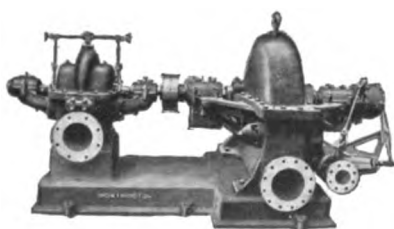
TYPE "OS" VOLUTE PUMP DIRECT CONNECTED TO ELECTRIC MOTOR

Type "OS" Volute Pumps—For handling large quantities of water at maximum efficiency where head does not exceed 100 ft. Any tendency to end thrust has been eliminated by making impeller of double suction type. Horizontally split casing permits of ready inspection of internal parts. This type is designed for electric motor or steam turbine drive.

TYPE "OS" VOLUTE PUMPS
Maximum head, 100 ft.

Size, in.	Discharge diam., in.	Suction diam., in.	Gals. per min.	Approximate h. p. required	Approximate over-all dimensions of motor-driven unit, in.		
					Length	Width	Height
2	2	2½	40 to 260	.50 to 15.2	62½	20	25½
3	3	3	100 to 400	.86 to 19.5	62½	22	26½
4	4	4	150 to 600	1.2 to 26.6	62½	23	30
5	5	5	230 to 1000	1.7 to 42.7	68	26	31½
6	6	6	360 to 1600	2.5 to 63.0	68	28	33½
8	8	8	600 to 2600	4.0 to 100.0	87	32½	35
10	10	10	1000 to 4500	6.7 to 173.0	87	38	41
12	12	12	1600 to 6000	10.0 to 219.0	95½	40	45

Type "BS" Volute Pumps—Similar to Type "OS" but for more severe service and for heads up to 200 ft. In addition to the double suction type of impeller, a special by-pass connecting the pressure chambers is provided, thereby insuring absolute hydraulic balance when working against high pressures. Standard split bush ring oiled type of bearing. Volute suction head contributes to make these pumps especially efficient.

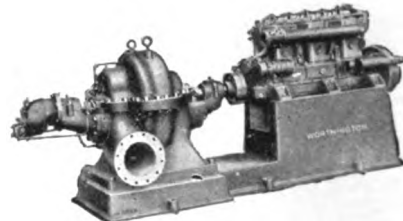


TYPE "BS" VOLUTE PUMP DIRECT CONNECTED TO STEAM TURBINE

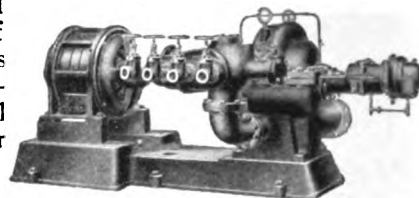
TYPE "BS" VOLUTE PUMPS
Maximum head, 200 ft.

Size, in.	Discharge diam., in.	Suction diam., in.	Gals. per min.	Approximate h. p. required	Approximate over-all dimensions of motor-driven unit, in.		
					Length	Width	Height
3	3	5	125 to 600	1.2 to 53.5	62	26½	31
4	4	6	200 to 900	1.6 to 72.0	62	28	33
5	5	8	360 to 1800	2.6 to 144.0	86½	31½	35
6	6	8	500 to 2200	3.5 to 161.0	86½	33	36½
8	8	10	800 to 3500	5.2 to 248.0	90½	39	44½
10	10	12	1200 to 5000	7.6 to 341.0	100	43½	46
12	12	16	2300 to 6500	14.3 to 432.0	100	44	48

Class "SD" Volute Pumps—For regular all around factory and industrial high pressure service. Built in 2 stages for heads up to 360 ft. and in 4 stages for heads up to 720 ft. Sump casing is of double volute type, horizontally split. Impellers placed back to back in order to hydraulically balance end thrust. Bearings are of dustproof, ring oiled removable shell type. Small number of parts makes "SD" pump especially desirable where water contains sand or grit. This type has been approved by National Board of Fire Underwriters and can be furnished equipped with all necessary fittings for fire service.



TWO-STAGE "SD" VOLUTE PUMP DIRECT CONNECTED TO GASOLINE ENGINE



1000-GAL. UNDERWRITERS' FIRE PUMP

Multistage Centrifugal Pumps

For service in connection with water works, hydraulic elevators, mine drainage, boiler feeding high pressure fire service, house service, etc.



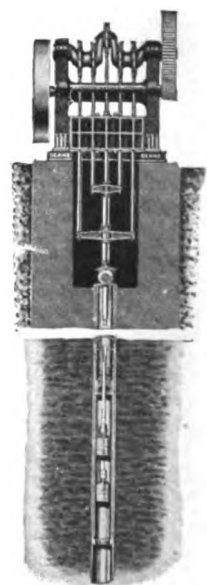
WORTHINGTON DOUBLE SUCTION BOILER FEED PUMP

The single suction turbine type in 2, 3, and 4 stages will deliver against a head of 180 ft. per stage. The double suction turbine type, built in 1, 2, 3 and 4 stages, is especially recommended for boiler feeding on direct turbine drive and for all heads over 160 ft. or 70 lbs. Its design automatically assures perfect hydraulic balance and freedom from end thrust. Sizes range from 4- to 10-in. capacities up to 3500 gals. per minute.

Other types of multistage centrifugal pumps are stocked to meet conditions of any pumping service.

Deep Well Pumps

Glendora pumps are unexcelled for deep well pumping in connection with municipal supply, irrigation, railroad tank service office and factory buildings, paper mills, ice making plants and packing houses. They are

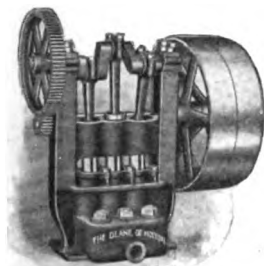


GLENDDORA DEEP WELL PUMP

adaptable to wells 8 in. and above in diameter, and are particularly applicable where the service is severe and continuous.

Briefly their advantages are: larger capacity from a given well than any other reciprocating pump; high mechanical efficiency; uniform, continuous flow of water in riser pipe; uniform load on prime mover; small engine or motor required to operate; absolute reliability; low operating cost; low maintenance cost; ability to discharge directly into mains; accessibility; heavy substantial construction.

Many other types of deep well pumps are built, from centrifugal to steam driven plunger, single or duplex.



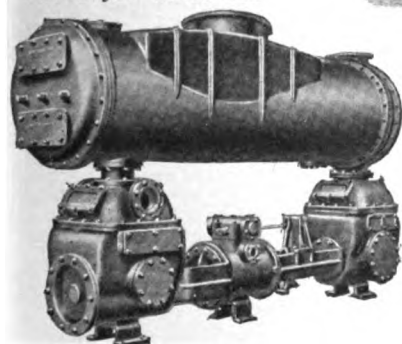
VERTICAL TRIPLEX SINGLE ACTING POWER PUMP

Condensing Equipment

Worthington can furnish steam condensing apparatus to meet the requirements of any set of operating conditions that may exist. The line includes every type of jet condensing equipment, spirojector, ejector and barometric types as well as surface condensers from the very smallest sizes to the largest units ever built in the United States.



SINGLE HORIZONTAL AIR PUMP WITH ADJUSTABLE CONE JET CONDENSER



WORTHINGTON STANDARD SURFACE CONDENSER MOUNTED OVER COMBINED AIR AND CIRCULATING PUMP



WORTHINGTON COUNTER CURRENT BAROMETRIC CONDENSER



WORTHINGTON SPIROJECTOR CONDENSER

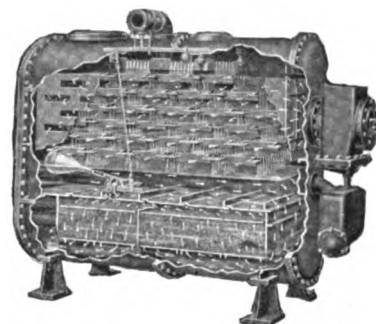
Being pump manufacturers on such a large scale enables Worthington to supply auxiliaries best suited to the needs of the particular condenser selected.

Feed Water Heaters

Stilwell feed water heaters are built by Worthington in several types and sizes up to 1000 h.p. for use with engines or pumps exhausting free to atmosphere, and up to 20,000 h. p. for condensing plants.

The Stilwell heater combines in one unit a feed water heater, a feed water purifier, a condensation and a feed water softener.

In a non-condensing plant, it will save at least 16% of the coal bill and will add to the boiler one-sixth more steam producing capacity. In a plant operating condensing, the exhaust steam, after having been condensed, is passed through the heater, thereby raising the temperature by utilizing the heat in the exhaust from auxiliaries.



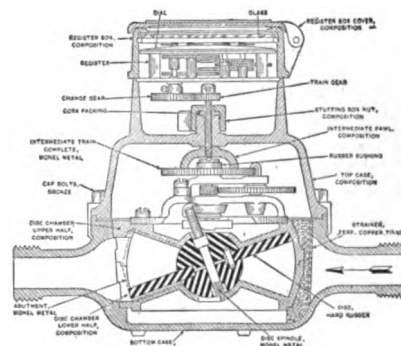
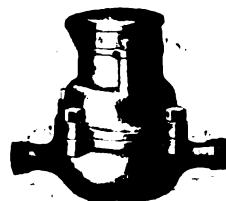
HORIZONTAL TYPE STILWELL FEED WATER HEATER

Meters for Hot and Cold Water, Gasoline, Oil, etc.

The Worthington line of meters permits the selection from among its various types and sizes of a meter to meet particular conditions as to quantity and rate of flow.

Model "G" Flat Disc Meter—Embodies in one meter: full size disc and measuring chamber; largest capacity of any meter; low frictional resistance; fewest individual parts; low weight; extreme accuracy; insurance against chemical troubles and freezing, and an intermediate train which will outwear any other form or make of train gearing hitherto manufactured.

Turbine Meters—Designed primarily to handle large volumes of water with minimum loss of pressure.



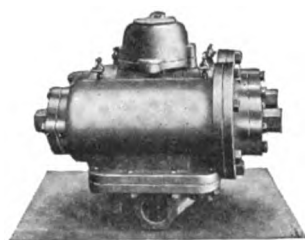
MODEL G. WORTHINGTON METER
TURBINE METERS

Size, in.	Capacity, gals. per min.	
	Normal	Maximum
2	150	240
3	330	540
4	600	960
6	1300	2100
8	2350	4000
10	3700	6000
12	5300	7500



VELOCITY TURBINE PATTERN

Compound Meters—Combine the characteristics and capacities of the disc and turbine meters in that they will register over a wider range of flows than either of the above types and are, therefore, especially suitable where the flow of water is subject to considerable variation.

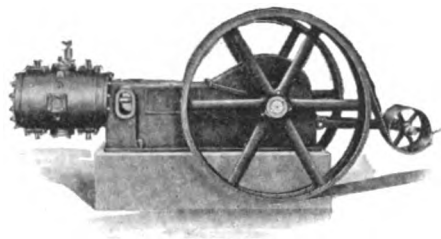


WORTHINGTON DUPLEX
PISTON METER

Duplex Piston Meters
—For measuring crude oil, petroleum, etc., and recording amount used in connection with oil burning apparatus. This type of meter, because of its absolute accuracy, is essential to the proper testing of the boiler plant.

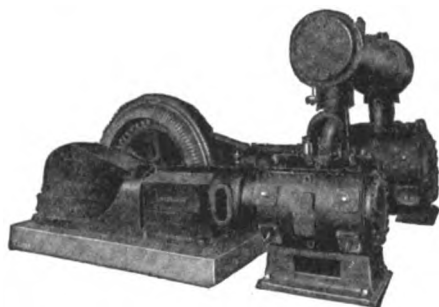
Hot Water Meters—
For boiler testing and boiler feed lines. Made in a variety of types and sizes.

Air, Gas and Ammonia "Feather" (Reg. U. S. Pat. Off.) Valve Air Compressors



SINGLE-STAGE, BELT DRIVEN AIR COMPRESSOR

Single Belt Driven						Single Steam Driven					
Cylinder diameter, in.	Stroke, in.	R. p. m.	Displacement, cu. ft. per min.	Air pressure, lbs. per sq. in.	Motor h. p.	Steam cylinder, in.	Air cylinder	Stroke, in.	R. p. m.	Displacement, cu. ft. per min.	Air pressure, lbs. per sq. in.
7 1/2	6	350	106	80-100	15-17	7 1/2	6	350	106	80-100	15-17
8 1/2	6	300	170	80-100	25-28	8 1/2	6	300	170	80-100	25-28
10	10	285	250	80-100	37-42	10	10	275	245	80-100	37-42
11	12	270	350	80-100	51-58	10	11	12	260	338	80-100
13	14	245	522	80-100	75-84	12	13	14	235	500	80-100
15	16	220	710	80-100	98-118	14	15	16	210	680	80-100
11	10	285	312	40-55	35-43	9	11	10	275	300	40-60
13	12	270	495	40-55	55-69	10	13	12	260	475	40-60
15	14	245	695	40-55	76-92	12	15	14	235	665	40-60
18	16	220	1030	40-55	112-136	14	18	16	210	981	40-60
12	9	300	335	20-30	28-35	8	12	9	300	335	30
13	10	285	435	20-30	35-45	9	13	10	275	418	30
15	12	270	660	20-30	54-69	10	15	12	260	632	30
18	14	245	1000	20-30	78-96	12	18	14	235	961	30
22	16	220	1540	20-30	116-146	14	22	16	210	1470	30



TWO-STAGE DIRECT CONNECTED MOTOR DRIVEN "FEATHER"
VALVE COMPRESSOR

Size, in.	Displacement, cu. ft. per min.	R. p. m.	Air pressure lbs. per sq. in.	Motor h. p.
13 and 8 x10	455	300	80-100	72-81
15 and 9 1/2 x12	670	277	80-100	108-121
18 and 11 x14	1050	257	80-100	166-186
22 and 13 x16	1570	225	80-100	235-265
24 and 14 x18	1860	200	80-100	292-326
27 and 16 1/2 x18	2350	200	80-100	347-390
27 and 16 1/2 x21	2470	180	80-100	380-420
30 and 18 x21	3050	180	80-100	475-530
27 and 16 1/2 x24	2575	164	80-100	390-435
30 and 18 x24	3200	164	80-100	500-560

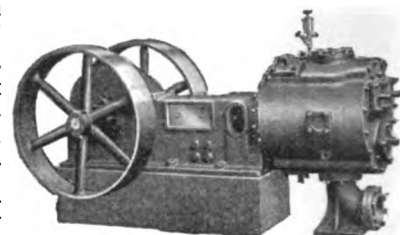
Worthington carries in stock a full line of sizes and types of "Feather" valve compressors from the small vertical belt driven compressor suitable for the shop requiring small quantities of air to the large duplex two-stage direct motor or steam driven units.

All compressors are equipped with "Feather" (Reg. U. S. Pat. Off.) valves, unquestionably the most efficient and durable valves yet designed for compressor service. These extremely simple valves insure efficient, quiet and safe operation at high rotative speeds, minimum air friction, low maintenance cost and ease of access.

Only a few of the many sizes and types are indicated.

Vacuum Pumps

Equipped with the same "Feather" (Reg. U. S. Pat. Off.) valves that have made Worthington air compressors so universally successful. Carried in stock in many sizes, arranged for belt, steam and direct drives.



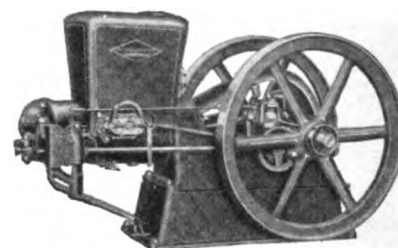
SINGLE BELT DRIVEN "FEATHER"
VALVE DRY VACUUM PUMP

Kerosene Engines

For general service, electric storage battery work, factories, foundries, feed mills, elevator shops and farms.

Sizes, 1 1/2, 2 1/2, 4, 6, 8, 10, 15, 20 and 25 h.p. The 20- and 25-h.p. engines are cooled by running water or thermo-siphon cooling tank; other sizes are hopper cooled as shown in illustration.

All sizes equipped with throttling governor.

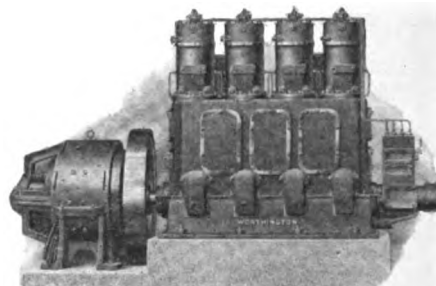


WORTHINGTON KEROSENE ENGINE
Kerosene-oil-distillate-gasoline throttling governor

Heavy Oil Engines

Of the vertical two-stroke cycle, solid injection, crosshead type with ignition occurring from temperature of combustion.

These engines are adapted to any stationary power purpose on land or shipboard within their range of sizes,



WORTHINGTON DIESEL ENGINE
Two-cycle, solid injection type

such as driving generators, pumps, hoists, line shafts, etc. Even in extremely cold weather, starting takes but 15 seconds with special Worthington igniter.

Burn all the cheaper grades of oil.

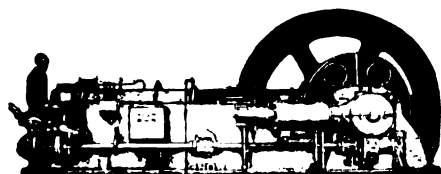
Built in 1, 2 and 4 cylinders delivering 25, 40, 50, 60, 80, 100, 120, 160 and 240 h.p.

Snow Oil Engines

Of the horizontal, full Diesel type. The operation shows economies that greatly exceed those obtained by gas engines, steam engines or any other type of prime mover.

The heaviest and cheapest oils can be used for fuel.

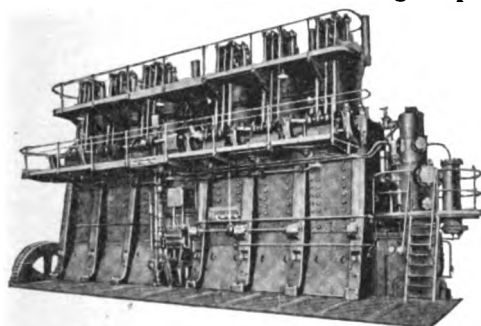
Built in 1, 2 and 3 cylinders in sizes from 65 to 600 b.h.p.



150 H.P. SINGLE CYLINDER SNOW OIL ENGINE

Large Vertical Oil Engines

Of the 4-stroke cycle full Diesel stationary or marine type in sizes up to 2400 h.p. They are especially desirable for heavy duty continuous operation service in connection with electric light and power plants, pumping stations, mining and cement industries and industrial plants of all kinds. The engines are entirely American designed and built and have incorporated in them the best features of modern Diesel engine practice.



WORTHINGTON 2400 H.P. VERTICAL OIL ENGINE

Hydraulic Turbines and Water Wheels

For utilizing to the greatest advantage the potential power in any available water shed, Worthington manufactures hydraulic turbines of the well-known Francis reaction type. For low head service from 10 to 50 ft.

the line includes vertical and horizontal standard wheels of the open flume as well as enclosed casing type, ranging in output from 32 to 6400 b.h.p., and in speed from 385 to 275 r.p.m. For medium head service from 50 to 300 ft. the sizes run from 50 to 5000 b.h.p. and in speed from 900 to 240 r.p.m.

For high head service,

up to 1000 ft., where a multitude of varying conditions must be met, special designs will be submitted to meet the existing conditions.

Filter Presses

These are manufactured in two types and several capacities. The Smith-Vaile vertical and horizontal

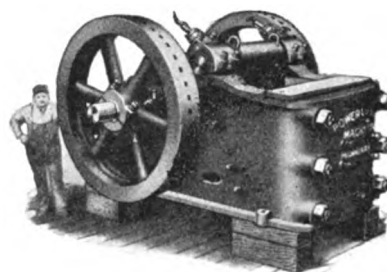
styles are designed for oil mills and chemical plants where the demand is for a press of medium capacity.

The fields of application for the Worthington filter press are practically unlimited. A few of the more prominent uses are for sugar factories, both cane and beet; packing houses, for edible and inedible beef and hog tannage; oleomargarine, blood, etc.; mining industries for the treatment of slimes; sewage and sludge disposal plants, and a great variety of uses in the chemical industry.

Mining and Cement Machinery

Jaw Crushers

—Superior type, made in sizes from 7x10 to 84x66 in., with either cast steel or semisteel frame reinforced with forged steel rods.

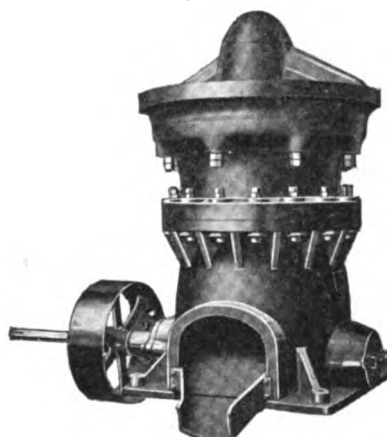


SUPERIOR JAW CRUSHER

Gyratory Crushers

—Made in superior McCully (patented) type with feed openings from 8 to 72 in. Lubrication is force feed to eccentric bearing and gearing. Capacities, 4½ to 1500 tons per hour, depending on size of crusher and ring size of material.

Standard McCully gyratory crusher made in sizes from No. 1 to No. 11, inclusive.

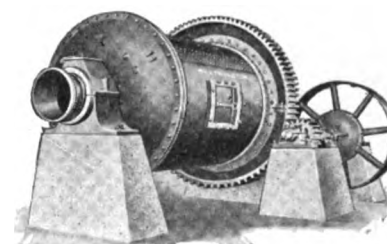


36-IN. SUPERIOR MCCULLY CRUSHER

Cylindrical Mills

—Worthington makes ball mills in all diameters and lengths, with any type of lining or drive.

Tube mills of the same characteristics, also rod mills in diameters and lengths to suit conditions.



CYLINDRICAL BALL MILL WITH CLUTCH PULLEY DRIVE

Rolls—Made in Garfield, Superior and Simplex types in diameters from 12 to 78 in., with various widths of face, according to conditions, and with pulleys either of the flywheel or standard type.

Jigs—Of the Woodbury type with iron hatches. Made with any desired number of compartments, also a full line of Hartz jigs, with either wood or iron hatches.

Other Equipment—In addition to the above line, Worthington makes a large line of screens both for dry and wet screening; stamp mills; sampling devices; log washers; upright, horizontal and Pierce-Smith type converters together with a complete line of converter accessories such as slag cars, matte and slag ladles, ladle bails, pots, straight line casting machines, round or rectangular water jacketed blast furnaces for either silver, lead or copper.



WORTHINGTON HYDRAULIC TURBINE RUNNERS

YEOMANS BROTHERS COMPANY

Sewage Ejectors and Pumping Machinery

1420 Dayton Street
CHICAGO, ILL.

REPRESENTATIVES

ATLANTA, GA., BURFORD, HALL & SMITH, Third National Bank Building
BALTIMORE, MD., MORTON MCL. DUKEHART & Co., McComas and Race Streets

BIRMINGHAM, ALA., E. N. CUNNINGHAM, Brown-Marx Building

BOSTON, MASS., POWER EQUIPMENT Co., 131 State Street

BUENOS AIRES, ARGENTINA, BUXTON, GUILAYN & Co.

BUTTE, MONT., C. H. COBB, Daly Bank Building

CHARLOTTE, N. C., J. R. PURSER, Commercial Bank Building

CINCINNATI, OHIO, O. J. ALLONIER, Provident Bank Building

CLEVELAND, OHIO, CLEVELAND PUMP & SUPPLY Co., Kirby Building
DALLAS, TEX., JOHN H. VAN ZANDT, Southwestern Life Insurance Building

DAVENPORT, IOWA, D. C. MURPHY, Security Building

DAYTON, OHIO, CHAS. M. KELSO Co., Reibold Building

DENVER, COLO., J. J. DALY, 230 15th Street

DETROIT, MICH., POWER PLANT SUPPLY Co., Penobscot Building

EL PASO, TEX., GEO. W. HERLIN, 202 Mills Building

HONOLULU, T. H., HONOLULU IRON WORKS

INDIANAPOLIS, IND., WEINSHANK & FENSTERMAKER, Hume-Mansur Building

KANSAS CITY, MO., McCULLEY-WIDENER & WRIGHT, 303 East 10th Street

LITTLE ROCK, ARK., P. E. FALLON, Gazette Building

LOS ANGELES, CAL., F. C. MILLARD Co., Marsh-Strong Building

MILWAUKEE, WIS., CHAS. W. MILLER, 209 Grand Avenue

MINNEAPOLIS, MINN., HEALY-RUFF Co., Plymouth Building

MONTREAL, TORONTO, WINNIPEG, CANADA, DARLING BROS., LTD.

NEW ORLEANS, LA., H. J. POWERS, Canal Bank Building

NEW YORK, N. Y., E. A. JULIE, 51 East 42d Street

OMAHA, NEBR., McCULLEY-WIDENER & WRIGHT, 1820 St. Marys Avenue

PHILADELPHIA, PA., CHAS. C. ENDERLE, Commercial Trust Building

PITTSBURGH, PA., CARL D. BUSHNELL, 206 Wood Street

PORTLAND, ORE., GORDON & FINKBEINER, 224 Pine Street

ROCHESTER, N. Y., J. F. BRIGHTMAN, Mercantile Building

SALT LAKE CITY, UTAH, HAWLEY-RICHARDSON-WILLIAMS Co., Dooly Building

ST. LOUIS, MO., J. T. McANULTY, Syndicate Trust Building

SAN FRANCISCO, CAL., CALIFORNIA HYDRAULIC ENGINEERING & SUPPLY Co., 70 Fremont Street

UTICA, N. Y., CHAS. M. KELSO Co., City National Bank Building

VANCOUVER, B. C., JNO. W. THOMPSON Co., LTD., 510 Hastings St. W.

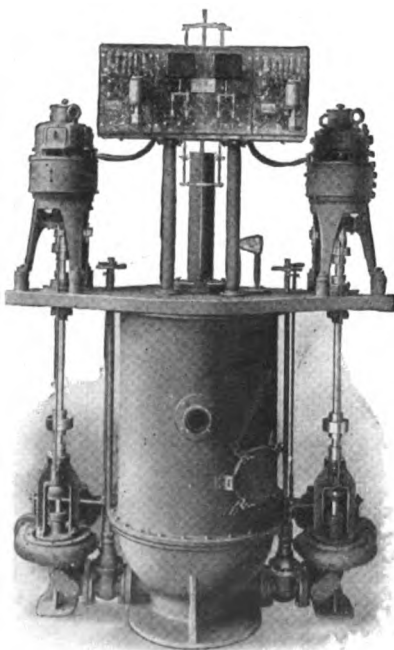
Products

YEOMANS FORM "A" DUPLEX CENTRIFUGAL ELECTRIC SEWAGE EJECTORS; SHONE PNEUMATIC SEWAGE EJECTORS; YEOMANS SINGLE and DUPLEX ELECTRIC BILGE or SUMP PUMPS; YEOMANS HOUSE PUMPS; CONDENSATION RETURN PUMPS.

Also manufacturers of Pumping Machinery for all purposes.

Yeomans Form "A" Sewage Ejector

A duplex equipment consisting of two special vertical centrifugal pumps operating in dry pit, connected to cast iron sewage receiver and driven by direct connected vertical motors mounted on receiver cover, equipped with automatic controllers, high water alarm, pit drainage connections, cast iron bar screen of large area, gate and flush back check valves. Pumps arranged so that top plate can be raised without disturbing shafting, bearings or impellers. No accumulation of solids in receiver; minimum space requirements; high efficiency; noiseless; sanitary and reliable.



FORM "A" DUPLEX EJECTOR

FORM "A" DUPLEX SEWAGE EJECTORS

No.	3	4	5	6
Capacity each unit, g. p. m.	100-125	150-200	250-350	400-500
Pit diameter, ft.	8	8	8	10
Depth of pit below inlet, ft.	4	4	4	5

Shone Pneumatic Sewage Ejector

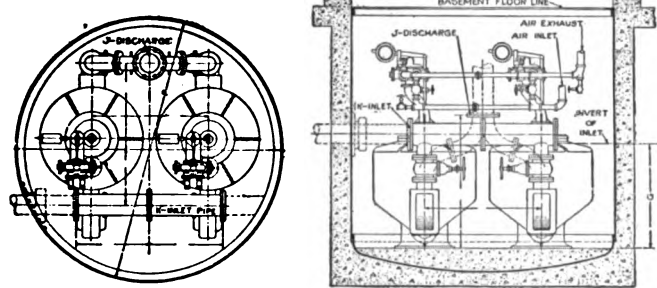
The Shone ejector has been in successful service in all parts of the world for over 35 years. First installation in this country in 1888 is still in service. At the World's Fair in Chicago in 1893, 52 Shone ejectors handled all sewage.

Unequalled for substantial design, durability, economy and reliability in operation. No screens required; bottom discharge and no accumulation of solids; special non-clogging check valves; no airtight floats; bronze, pressure operated, quick acting piston type automatic air valves. Furnished with either motor or steam driven



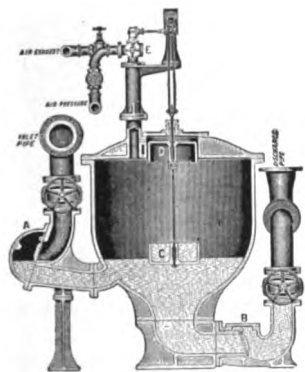
250-GALLON SHONE DUPLEX EJECTOR

air compressors. Compressors can be located at any desired distance from ejectors. Ejectors can be operated from air supply maintained for general purposes in industrial plants. Especially recommended for municipal work.



DIMENSION DIAGRAM OF SHONE DUPLEX EJECTOR

G. p. m. each unit	G ft. in.	Single Ejectors			Duplex Ejectors	
		F, ft.	J, in.	K, in.	F, ft.	J and K, in.
50	3-1	6	4	6	8	6
100	3-7	7	5	6	9	8
150	4-5	7	5	6	9	8
200	5-10	8	6	8	11	8
250	6-5	8	6	8	11	8
300	7-0	8	6	8	11	8
400	7-3	13	12	12	14	12
500	8-0	13	12	12	14	12
600	8-9	13	12	12	14	12
750	8-0	14	14	14	16	14
1000	9-0	14	16	16	16	16



SHONE EJECTOR, SECTIONAL VIEW

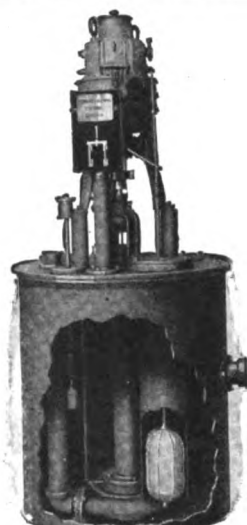
Yeomans Bilge Pumps

Single Electric—Automatic, self-contained, heavily constructed slow speed machines, with submerged centrifugal pumps, vertical direct connected motors and automatic controllers for handling waste water and sewage.

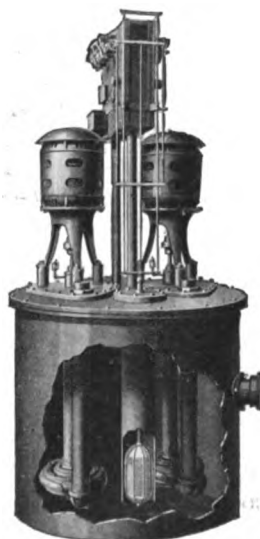
Built in two grades; Grade 1, pumps operating at slow speeds and equipped with high water alarm, pipe casing for float, force feed lubricated bearings, etc. Grade 2, moderate speed.

SINGLE ELECTRIC BILGE PUMPS

No.	Capacity, g. p. m.	Basin diam., in.
1/2	15-25	24
1	35-50	36
2	50-75	36
3	100-125	36
4	150-200	36
5	250-350	48
6	400-500	48



GRADE 1 BILGE PUMP



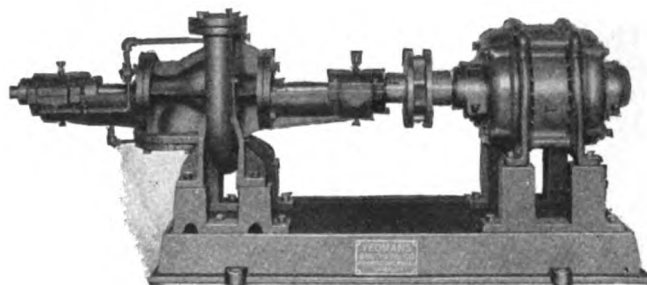
YEOMANS DUPLEX ELECTRIC BILGE PUMP

Duplex Electric Bilge Pumps or Submerged Sewage Ejectors—Construction similar to single bilge pumps; units arranged so that one can be removed without disturbing the other. Capacities per unit same as single bilge pumps.

Basin diameters: Nos. 1 and 2, 36 in.; No. 3, 48 in.; Nos. 4 and 5, 60 in.

Yeomans Centrifugal House Pumps

Most improved type, single and multistage, high efficiency, quiet running pumps with ring oiled, water cooled external shaft bearings, perfectly balanced rotors, flexible couplings. Special attention given to noiseless pumps for high class apartment buildings, residences and hotels. Complete automatic equipments furnished for either roof tank or compression tank service, any capacity.



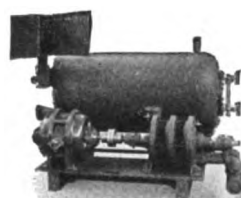
YEOMANS SINGLE STAGE CENTRIFUGAL HOUSE PUMP

Yeomans Condensation Return Pumps

High grade equipments consisting of cast iron receiver with water glass, direct connected centrifugal pump and motor, all on one base, enclosed quick break butt contact automatic switch, seamless copper float and protective devices.

Type "H" Pumps—For returns above basement floor level.

Type "V" Pumps—For returns close to or below basement floor.

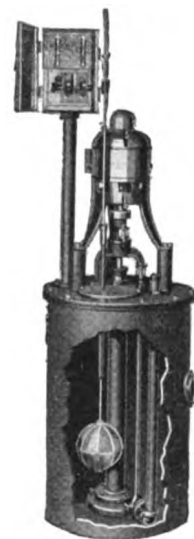


CONDENSATION RETURN PUMP

Special Type "H" high pressure unit with multistage pump

TYPES "H" AND "V" CONDENSATION RETURN PUMPS

No.	Capacity, g. p. m.	Maximum direct radiation, sq. ft.
1	5	1,000
2	10	3,000
3	15	6,000
4	20	10,000
5	30	15,000
6	60	30,000



TYPE "V," CONDENSATION RETURN PUMP

References

Yeomans pumps and Shone ejectors have been in service in important city buildings, industrial plants and municipalities for many years. Installations can be referred to in all parts of the world.

PLATT IRON WORKS

Manufacturers of Steam and Power Driven Pumps

DAYTON, OHIO

DISTRICT REPRESENTATIVES

BALTIMORE, MD.
BIRMINGHAM, ALA.
BOSTON, MASS.
CHICAGO, ILL.

MONTREAL, QUE.

CLEVELAND, OHIO
DAYTON, OHIO
JACKSONVILLE, FLA.
CINCINNATI, OHIO

NEW YORK, N. Y.
PHILADELPHIA, PA.
PITTSBURGH, PA.
RICHMOND, VA.

SAN ANTONIO, TEX.
SAVANNAH, GA.
TAMPA, FLA.
UTICA, N. Y.

TORONTO, ONT.

Products

SMITH-VAILE DIRECT ACTING STEAM PUMPS;
SMITH-VAILE SINGLE ACTING TRIPLEX POWER PUMPS;
PUMP and RECEIVER COMBINATIONS; PLATT CENTRIFUGAL PUMPS.

Service

An adequate service department for the repair of Smith-Vaile and Platt pumps is maintained at Dayton, Ohio.

Parts most commonly required are carried in stock.

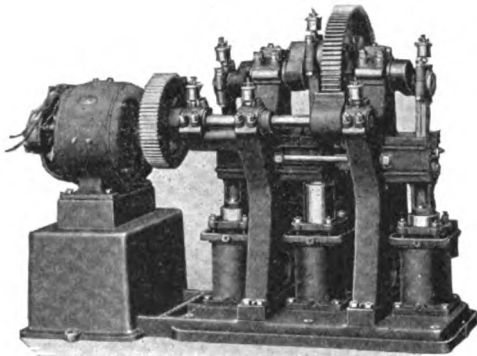


Fig. 3049

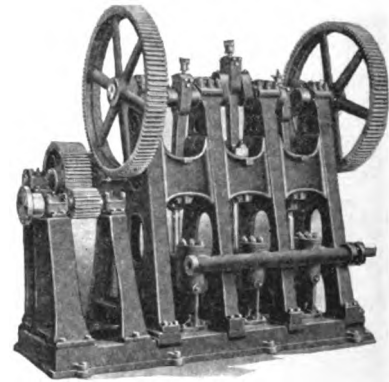


Fig. 2865

SMITH-VAILE TRIPLEX POWER PUMPS

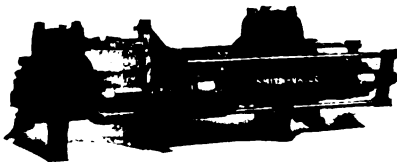


Fig. 2072

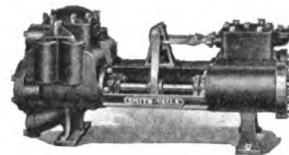


Fig. 7

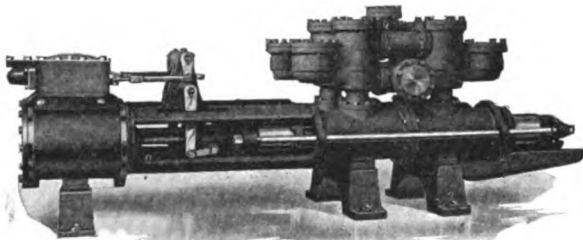


Fig. 818

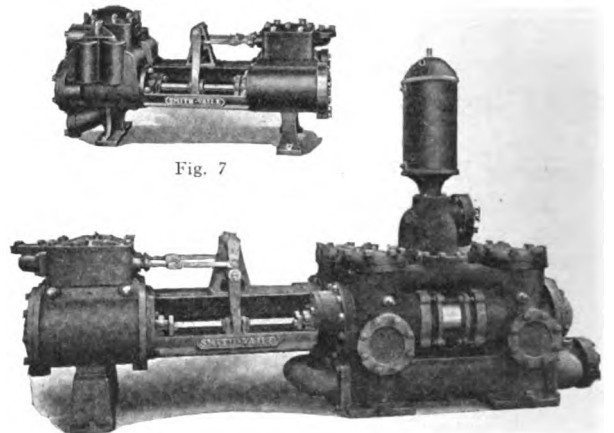


Fig. 2111

SMITH-VAILE DIRECT ACTING STEAM PUMPS

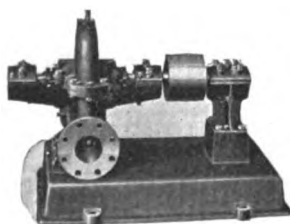


Fig. 2855

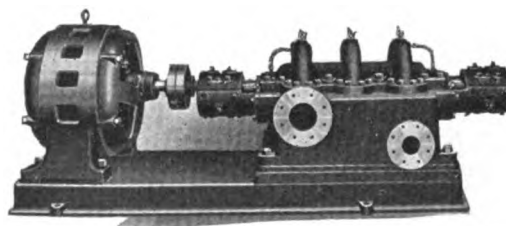


Fig. 3032

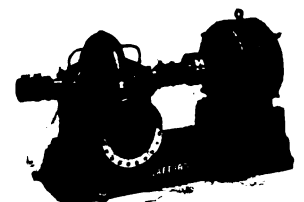


Fig. 2242

PLATT DOUBLE SUCTION CENTRIFUGAL PUMPS

BURY COMPRESSOR COMPANY

Manufacturers of Air and Gas Compressors and Vacuum Pumps

MAIN OFFICE AND WORKS
1710 Cascade Street
ERIE, PA.

Products

AIR and GAS COMPRESSORS, steam or motor driven.

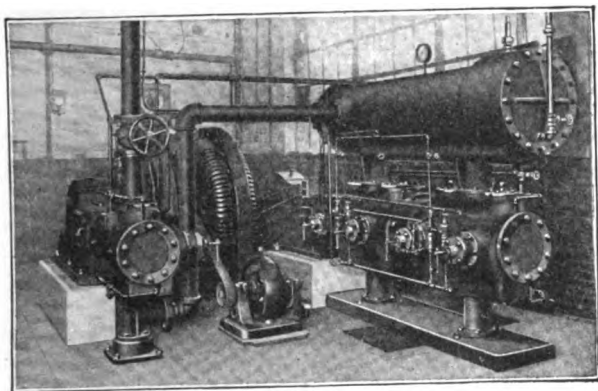
VACUUM PUMPS, steam or motor driven.

Compressors and pumps are built for all capacities, all pressures, and to meet any engineering requirements.

Also manufacturers of Air Receivers and After Coolers.

Bury Class VCCE Compressors

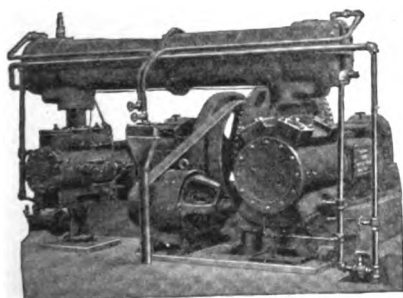
A 2-stage, 3-cylinder, variable volume type (patented). Operates at same efficiency at $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ and full load at 1 lb. variation in pressure. Lowest input horsepower per cubic foot actual air delivered. Motor or belt drive.



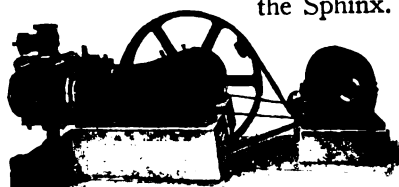
CLASS VCCE 2-STAGE, 3-CYLINDER, VARIABLE VOLUME COMPRESSOR, WITH SYNCHRONOUS MOTOR ON SHAFT
Capacity, 300 to 10,000 cu. ft. per min.

Bury Class DCCU and CCB Compressors

Duplex compound type, belt or motor driven.



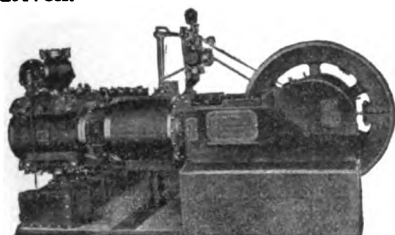
CLASS DCCU, DUPLEX COMPOUND, VARIABLE VOLUME COMPRESSOR
Capacity, 450 to 6000 cu. ft. per min.



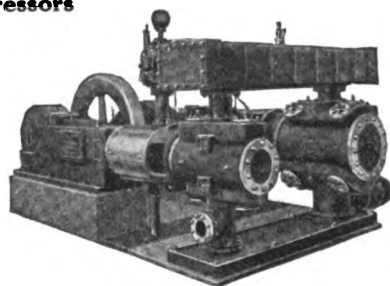
CLASS CCB DUPLEX COMPOUND COMPRESSOR, BELT DRIVEN
Capacity, 450 to 1500 cu. ft. per min.

Bury Class CCS and Uniflow Compressors

Duplex compound type, steam driven.



CLASS CCS DUPLEX COMPOUND COMPRESSOR, STEAM DRIVEN
Capacity, 450 to 1500 cu. ft. per min.



EXCEL TYPE DUPLEX COMPOUND COMPRESSOR, STEAM DRIVEN
Capacity, 450 to 6000 cu. ft. per min.
Highest steam economy

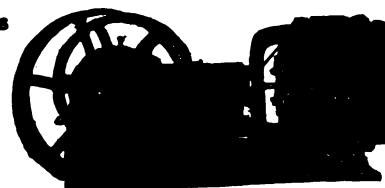
Bury 3-stage, Tandem and Duplex, High Pressure Compressors



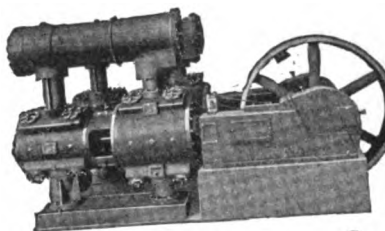
Belt Driven Steam Driven Steam Driven
3-STAGE, TANDEM AND DUPLEX, HIGH PRESSURE COMPRESSORS
Capacities, 5 to 1000 cu. ft. per min., up to 2000 lbs. pressure

Bury Vacuum Pumps

Single cylinder type built steam or belt driven. Duplex double compound type built steam or belt driven or with synchronous motor on shaft. Specially suitable for glass factories. Installed at:
Hazel-Atlas Glass Co.
Macbeth-Evans Glass Co.
Maryland Glass Corp.
American Bottle Co.
Owens Bottle Co.
Federal Glass Co.



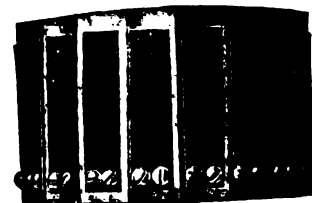
CLASS VL SINGLE-CYLINDER VACUUM PUMP



CLASS DBBC DUPLEX, DOUBLE COMPOUND, VACUUM PUMP

Bury Patented Pyramid Box Plate Valves

Have 50% greater area than any other type of valve. No tension springs. No buffer plates. Durable as the Pyramids. Silent as the Sphinx.



PYRAMID BOX PLATE VALVE

Bury Single-stage Compressors



CLASS L SINGLE-STAGE COMPRESSOR, BELT DRIVEN
Capacity, 38 to 1000 cu. ft. per min.



CLASS LS SINGLE-STAGE COMPRESSOR, STEAM DRIVEN
Capacity, 50 to 1500 cu. ft. per min.

Catalogues

Catalogues supplied on request.

CHICAGO PNEUMATIC TOOL COMPANY

Air Compressors and Semi-Diesel Oil Engines

1002 Chicago Pneumatic Building
NEW YORK, N. Y.

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Products

AIR COMPRESSORS: Steam, Belt, Short-belt Electric Motor, Oil, Gas and Gasoline Engine, and Direct Motor Drive.

SEMI-DIESEL OIL ENGINES.

For Pneumatic Tools, Electric Tools, Rock Drills, and Geared Hoists, see pages 18-19.



TRADE-MARK

CLASS N-SO2 FUEL OIL DRIVEN SIMPLATE VALVE AIR COMPRESSOR*

Piston & displacement	r. p. m.	Maximum h. p.	Floor space ft.-in.	Code
144	325	21	11- 9 x 3-5	†Avaraccio
212	325	29	13- 6 x 3-8	†Avaran
309	300	47	15- 4 x 4-7	Avare
370	250	57	18- 3 x 5-7	Avaretto
507	250	77	21- 6 x 6-0	Avargor
658	230	102	21-10 x 6-0	Azadones

* Compressors listed are for pressures up to 100 lbs. Information concerning machines for air pressures up to 50 lbs. furnished on application.

† Available in tank mounted type if desired.

‡ Cubic feet free air per minute.

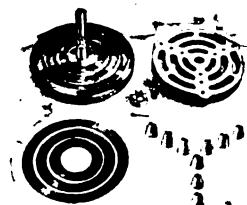
Air Compressors for All Requirements

This company's line of air compressors is particularly complete and embraces over 500 sizes and types for all possible requirements and conditions of service, in capacities up to 10,000 cu. ft. per minute. Standard sizes for steam, belt, electric, and oil, gas and gasoline engine drive can be shipped promptly (frequently from Branch stocks).

Special types built to meet requirements.

The Compressor with the Simplate Flat Disc Valve

Simplite flat disc valves are used exclusively in Chicago Pneumatic air compressors and represent the highest development yet attained in air valve design.

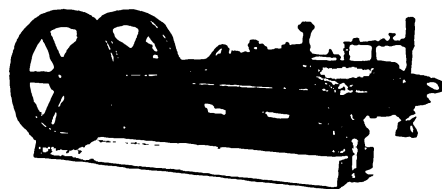


SIMPLITE DISCHARGE VALVE DISASSEMBLED

Their chief advantages are: Simplicity; practically indestructible; no lubrication required; noiseless operation; plates independent in action, one of another; applicable to all positions and conditions.

Class N-SO2 Fuel Oil Driven Air Compressors

Will operate on any petroleum distillate containing not more than 1% of sulphur or 25% asphaltum, and ranging from 28° Baumé scale up to and including kerosene. Also operate on many oils below 28° Baumé, depending on the character of the oil.



CLASS N-SO2 FUEL OIL DRIVEN SIMPLATE VALVE AIR COMPRESSOR

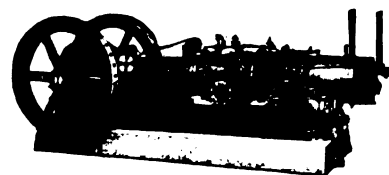
Absolute simplicity, compactness and high operating economy make these units an ideal air power plant. Simplicity of operation makes skilled attendants unnecessary.

Class N-SG and N-SGL Air Compressors (Gas and Gasoline Driven)

Similar in design to the Class N-SO2 machines. Well suited to rough, heavy duty. In operation require very little attention.

Class N-SG—Made in capacities up to 658 cu. ft. free air per minute. Will operate satisfactorily on any natural or artificial gas containing 600 or more B.t.u. per cu. ft.

Equipped with Simplate valves.



CLASS N-SG GAS DRIVEN SIMPLATE VALVE AIR COMPRESSOR*

Piston & displacement	r. p. m.	Maximum h. p.	Floor space ft. in.	Code
175	300	25	11-9 x 3-5	†Axberg
250	300	35	13-6 x 3-8	†Axbidder
401	300	62	15-4 x 4-7	†Axloma
492	250	77	18-3 x 5-7	†Axbolla
658	230	102	21-6 x 6-0	†Axbugle

* Compressors are listed for pressures up to 100 lbs. Information concerning machines for air pressures up to 50 lbs. furnished on application.

† Available in tank mounted type if desired.

‡ Cu. ft. free air per minute.

Class N-SGL—Specially designed to meet the requirements of a gasoline driven portable machine.

Equipped with Simplate valves and guaranteed to run satisfactorily on commercial grades of gasoline.

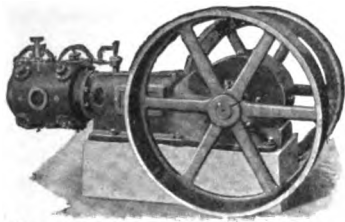
CLASS N-SGL GASOLINE DRIVEN SIMPLATE VALVE AIR COMPRESSORS*

Piston & displacement	r. p. m.	Maximum h. p.	Floor space, ft. in.	Code
144	325	21	11-9 x 3-5	†Avenimos
212	325	29	13-6 x 3-8	†Avenisteis

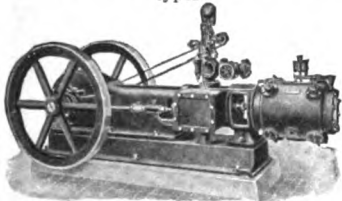
* Compressors are listed for pressures up to 100 lbs. Information concerning machines for air pressures up to 50 lbs. furnished on application.

† Available in tank mounted type if desired.

‡ Cu. ft. free air per minute.



CLASS N-SB SINGLE-STAGE BELT
DRIVEN COMPRESSOR
Built also in duplex and multistage
types



CLASS N-SS SINGLE-STAGE STEAM
DRIVEN COMPRESSOR

SINGLE-STAGE CLASS N-SB BELT DRIVEN AND CLASS N-SS
STEAM DRIVEN COMPRESSORS**

Air cylinder		L. P. H.	Piston displacement, cu. ft. per min.	Air pressure, lbs.	h. p.* re- quired	Code	
Diam., in.	Stroke, in.					Steam driven type†	Belted type
6	6	350	69	100-125	10- 11	Nasbrel	Nababsom
7½	6	350	107	50-100	13- 17	Nasdict	Nabacrid
8	8	300	139	100-125	24- 26	Nasenna	Nabadora
9	8	300	176	70-100	24- 30	Nesepor	Nebaegger
10	8	300	218	40- 70	24- 31	Nesfento	Nebaffling
12	8	300	314	15- 40	20- 34	Nesgrip	Nebaggot
	10	275	250	100-125	43- 48	Neshole	Nebahia
12	10	275	360	50-100	45- 62	Nismule	Nibajirn
15	10	275	562	30- 50	53- 79	Niskine	Nibajos
17	10	275	723	15- 30	45- 68	Nislake	Nibaklet
12	12	250	392	100-125	69- 78	Nismurk	Nibalena
14	12	250	534	50-100	70- 94	Nosnacco	Nobampo
17	12	250	788	30- 50	76-103	Nosomula	Nobandis
20	12	250	1092	15- 30	65-107	Nosostriis	Nobaola
14	14	235	549	100-125	103-123	Nosparry	Nobaptist
17	14	235	809	40- 80	118-141	Nosquan	Nobaqua
20	14	235	1120	15- 40	75-135	Nusraid	Nubaron

**Note: Class N compressors in the capacities listed can also be supplied with short belt electric motor drive, either in stationary, truck or skid mounted portable types.

*For belt driven compressors, this includes belt loss; for steam driven compressors, the figures stated are the indicated horsepower in the steam cylinder.

†6-, 8- and 10-in. stroke compressors have plain D-slide valve; 12- and 14-in. stroke have double ported balanced slide valves.

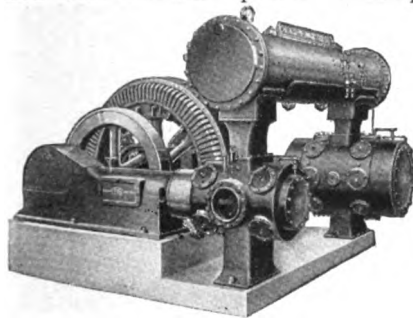
Class O-CE Electric Motor Driven Air Compressors

Highly efficient and compact.

A variable volume of air delivered at constant speed and with minimum power consumption is an important

operating characteristic. Built in single-stage and 2-stage, and in both duplex and duplex-tandem types, for either belted or direct connected motor drive. Capacities from 500 to 5000 cu. ft. of air per minute.

Equipped with Simplate valves.



CLASS O-CE 2-STAGE CHICAGO PNEU-
MATIC SIMPLATE VALVE MOTOR
DRIVEN COMPRESSOR

CLASS O-CE 2-STAGE SIMPLATE VALVE MOTOR DRIVEN
COMPRESSOR

Cylinders			Piston displ., cu. ft. per min.	r.p.m.	h.p.	Floor space, ft.-in.		Code
Low press.	High press.	Stroke, in.				Length.	Width.	
15	9	10	613	300	100	8 7	9 2	Overpraten
17	10	12	810	257	140	10 9	10 6	Overhigh
20	12	14	1308	257	225	12 0	12 0	Orlero
23	13	16	1730	225	301	14 5	11 3	Ormlille
24	14	18	1884	200	327	13 8	12 8	Overig
26	15	18	2212	200	383	17 6	14 8	Ovalis
26	15	21	2424	188	417	18 6	15 3	Ornasti

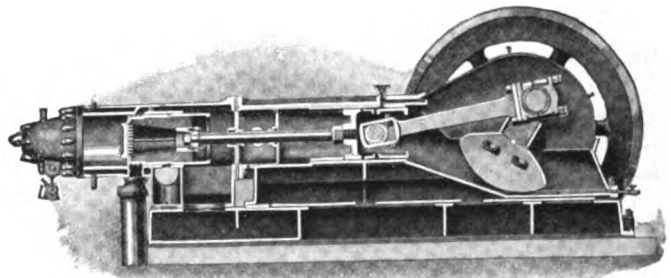
Giant Semi-Diesel Oil Engines

The most economical form of isolated power plants, having the over-all operating economy of the full Diesel type without its complexity, the dependability of the steam engine without its costly auxiliaries, and the ability to operate successfully and economically on low grade fuels.

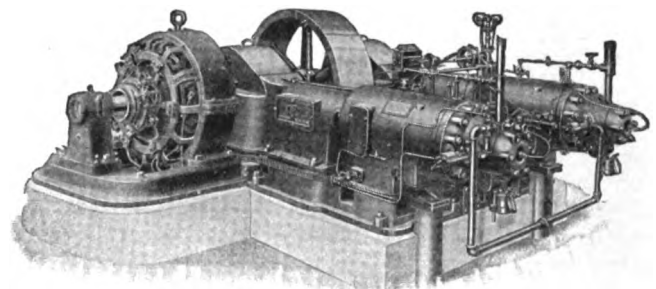
Principal Features—Horizontal, crosshead type of construction. Hot surface ignition instead of hot ball, hot bulb or electric ignition. Valveless 2-cycle power cylinders. Positive self-oiling system of lubrication. Governed fuel injection. Close speed regulation. Perfect scavenging of cylinder. Rugged horizontal enclosed frame. Removable covers and accessible bearings. Economy of fuel.

Guaranteed to run on any petroleum distillate, containing not more than 1% sulphur or 25% asphaltum, and ranging from 28° Baumé scale up to and including kerosene. Will operate satisfactorily on many oils below 28° Baumé, depending on character of oil.

Parts relatively few in number, and engine well suited to rough, heavy duty under conditions that prevent the employment of highly trained attendants.



GIANT SEMI-DIESEL OIL ENGINE, CLASS A-03
Sectional view, showing construction



GIANT DUPLEX SEMI-DIESEL OIL ENGINE, CLASS A-D03
100 h.p. direct connected to electric generator

A Complete Line—Giant oil engines are built in capacities from 12 to 200 h.p. as listed in the accompanying table. Ask for Bulletin 389.

GIANT SEMI-DIESEL OIL ENGINES, FOR GENERAL SERVICE*

Brake, h. p.	r. p. m.	Diam. flywheel, in.	Floor space, ft.-in.	Code
CLASS A-02—SINGLE TYPE				
12	400	42	7-2 x 3-0	Axiopolis
20	300	54	9-6 x 5-3	Axial
30	300	62	11-3 x 5-6	Axially
40	275	60	12-0 x 6-9	Axicorne
50	275	63	13-0 x 7-6	Axiculo
60	250	63	14-3 x 7-9	Axieros
80	230	72	16-8 x 8-4	Axifere
100	230	72	17-0 x 9-4	Ayrampo

CLASS A-D02—DUPLEX TYPE				
100	275	60	13-0 x 8-2	Axifugo
120	250	72	14-6 x 10-3	Axigraph
160	230	72	16-8 x 12-6	Axiladas
200	230	72	18-0 x 15-6	Azafamado

*These engines, when supplied for electric generator drive are equipped with extra heavy flywheels. When this type is desired add words, "Electric Service" to code word.

†On duplex type machine this dimension is that of the belt wheel, which serves also as the flywheel.

INGERSOLL-RAND COMPANY

Manufacturers of Compressors and Drilling Equipment

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11 Broadway

NEW YORK, N. Y.

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Products

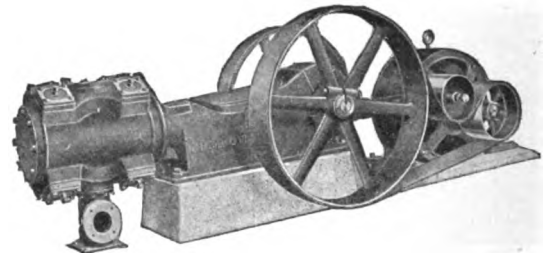
AIR COMPRESSORS; STEAM CONDENSING PLANTS; ROCK DRILLS; PNEUMATIC TOOLS; RIVETING HAMMERS; PORTABLE HOISTS.

Also manufacturers of Gas and Ammonia Compressors, Vacuum Pumps, Water Pumps, Air Lift Pumping Systems, Drill Sharpeners, Oil and Steam Engines, Vertical and Horizontal Gas Engines, Turbo Blowers and Compressors.

For Cameron Pumps, see page 632.



TRADE-MARK

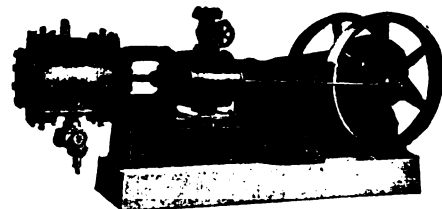


"INGERSOLL-RAND" CLASS "ER" COMPRESSOR

DATA, BELT DRIVE

Piston displacement, cu. ft. per min.	Pressure, lbs. per sq. in.	Speed, r. p. m.	B. h. p. including belt loss	Floor space, ft.-in.
28	100-150	500	4 -4.3	4-7 x 1-6
44	20-100	500	3.8-6.5	4-10 x 1-6
44	100-150	400	6.5-7	6-2 x 1-9 1/2
64	45-100	400	7.3-9.3	6-6 x 1-9 1/2
67	100-140	350	10-10	6-6 x 1-11
92	45-100	350	11-13	6-7 x 1-11
113	100-130	250	19-21	7-11 x 2-6 1/2
145	65-100	250	21-24	8-1 x 2-6 1/2
223	100-120	250	39-42	9-9 x 3-2 1/2
324	50-100	250	43-57	9-5 x 3-2 1/2
340	100-115	220	60-62	11-0 x 4-1 1/2
464	40-100	220	57-74	11-3 x 4-1 1/2

Data on standard machines for low pressures on request.



"INGERSOLL-RAND" CLASS "FR" COMPRESSOR

DATA, STEAM DRIVE

Air pressures to 125 lbs. Steam pressures, 80 to 175 lbs.

Piston displacement, cu. ft. per min.	Pressure, lbs. per sq. in.	Speed, r. p. m.	I. h. p. in steam cylinders	Floor space, ft.-in.
67	80-125	350	9-10	8-2 x 2-3
92	55-100	350	11-13	8-3 x 2-3
136	80-125	300	21-25	10-2 x 2-8
173	65-100	300	24-29	10-3 x 2-8
245	80-125	275	39-46	12-0 x 3-2
355	60-100	275	51-62	11-10 x 3-2
386	28-125	250	61-70	13-8 x 4-1
528	45-100	250	66-88	13-9 x 4-1

Data on standard machines for low pressures on request.

Air Compressors—"Ingersoll-Rand" and "Imperial" Types

Each type of air compressor that this company builds is designed to meet the requirements of some particular application. Each size is constructed with the ultimate object of supplying some one demand more efficiently and economically than could be done by any other manufacturer. Each detail of every compressor receives the benefit of the best engineering skill, while the materials entering into the construction of every Ingersoll-Rand compressor are selected with particular reference to the functions they are called upon to play in conjunction with the machine's entire operation.

Each machine's workmanship is typical of all Ingersoll-Rand workmanship, the very best obtainable. Such attention to design, materials and workmanship means that compressed air can be produced at bedrock prices, because more air is produced with a lower power input and a lower maintenance cost.

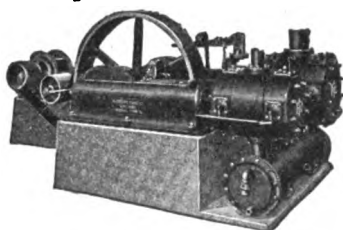
All compressors are of wholly enclosed construction with automatic flood lubrication of the reciprocating parts. This makes for cleanliness, the exclusion of dirt and grit from wearing surfaces, economy of lubricant and lessened need of attendance.

Classes "ER" and "FR" Compressors

Horizontal, double-acting, single-stage machines with belt wheel, short belt drive complete with motor, or direct-connected, piston valve steam engine, the latter with automatic cut-off control.

"Imperial" Type "XCB" Compressors

Single-stage and two-stage belt driven machines of the duplex type. Regularly fitted with 5-step Clearance Control regulation which automatically loads or unloads the compressor in five successive steps. Thus the compressor can operate at full load, three-quarter, one-half, one-quarter or no load. May also be had as complete units with electric motor and short belt drive.

**"IMPERIAL XCB-2" COMPRESSOR****"IMPERIAL XCB-2" COMPRESSOR**

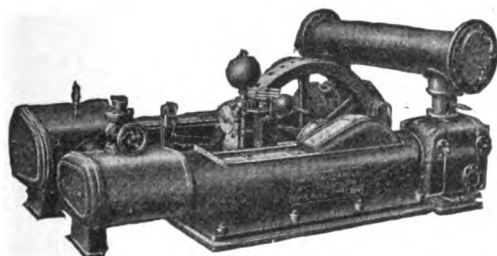
Air pressures, 80 to 100 lbs.

Piston displacement, cu. ft. per min.	Speed, r. p. m.	B. h. p. at air pressure given		Belt wheel, in.	Floor space, ft.-in.
		80 lbs.	100 lbs.		
610	250	94	103	72 x 14½	10- 7 x 6-5
695	250	95	104	72 x 14½	10- 8 x 6-6
785	250	95	104	72 x 14½	10- 9 x 6-7
877	240	132	145	78 x 18½	11- 9 x 7-8
985	240	131	144	78 x 18½	11-10 x 7-9
1098	240	130	142	78 x 18½	11-11 x 7-10
1244	215	189	207	84 x 24½	13- 0 x 8-8
1372	215	183	201	84 x 24½	13- 1 x 8-9
1507	215	178	195	84 x 24½	13- 2 x 8-10

Data on standard machines for low pressures on request

"Imperial" Types "X" and "XPV" Compressors

Single-stage and two-stage steam driven machines of duplex type. Simple and cross compound steam cylinders. The Type "X" has plain D steam valves on small sizes and Meyer adjustable cut-off type on larger units. The Type "XPV" has automatic cut-off governor and balanced piston steam valves and is suitable for high steam pressures and superheat.

**"IMPERIAL" TYPE "XPV" COMPRESSOR**

DATA, STEAM DRIVE

Air pressures, 80 to 110 lbs. Steam pressures, 80 to 150 lbs.

Piston displacement, cu. ft. per min.	Speed, r. p. m.	I. h. p. in steam cylinder at air pressures given		Floor space, ft.-in.
		80 lbs.	110 lbs.	
648	200	102	120	12- 0 x 7-8
940	180	148	174	13- 6 x 8-9
1260	180	200	235	14- 0 x 9-2
1531	160	242	284	17- 4 x 10-3
1955	160	306	360	17-10 x 11-0
3030	155	463	544	22- 3 x 13-6
4145	125	627	736	27- 7 x 17-3

Data on standard machines for altitudes on request.

Class "PRE" Compressors

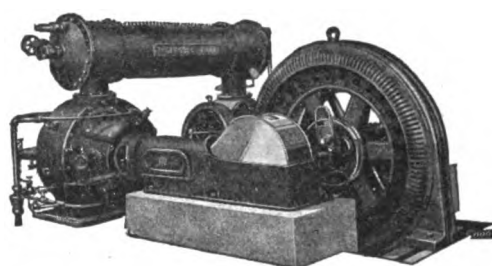
Duplex, single-stage and two-stage, direct connected, electrically driven units of capacities to 8145 cu. ft. per minute, pressures to 115 lbs. per sq. in. Regularly fitted with automatic Clearance Control.

CLASS "PRE" COMPRESSOR—ELECTRIC DRIVE

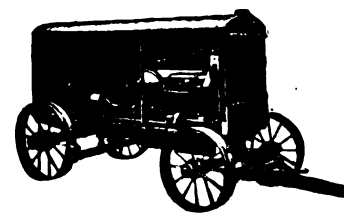
Air pressures, 50 to 115 lbs.

Piston displacement, cu. ft. per min.	Motor b. h. p. at air pressures given		Floor space, ft.-in.
	90 lbs.	100 lbs.	
1302	201	210	11-9 x 11-9
1574	251	264	14-3 x 12-6
2033	309	324	16-0 x 14-4
2874	455	478	18-0 x 16-0
3633	567	596	19-9 x 18-0
5011	752	787	25-0 x 19-0
5967	972	1020	29-3 x 20-0
7440	1120	1179	30-3 x 26-0

Data on standard machines for altitudes on request.

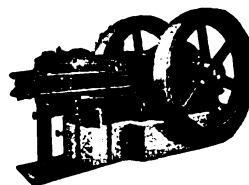
**"INGERSOLL-RAND" CLASS "PRE" COMPRESSOR****"Imperial Fourteen" Portable Compressors**

"Imperial" portable compressors are built in sizes as listed below and driven by either gasoline or electric motor. The compressing cylinders are fitted with Ingersoll-Rand plate inlet and discharge valves, automatic splash lubrication and "Imperial" intake unloader. The entire equipment is mounted on a steel frame, liberally proportioned, yet not unduly heavy. Suitable covering is provided which enables free access to all working parts.

**"IMPERIAL FOURTEEN" PORTABLE COMPRESSOR****"IMPERIAL FOURTEEN" PORTABLE AIR COMPRESSOR**

Piston displacement, cu. ft. per min.	Air pressure, lbs.	Driving motor	Drive	Weight complete, lbs.
45	90	Single-cyl.-2 cycle	Gas motor	1500
118	100	Twenty-five h. p.	Electric motor	4450
118	100	Four-cyl.-4 cycle	Gas motor	4000
210	100	Four-cyl.-4 cycle	Gas motor	6000

Data on steam driven outfits and skidded units, on request.

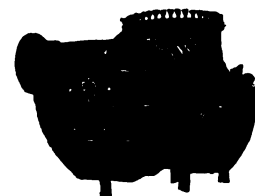
Stationary Oil Engines**INGERSOLL-RAND TYPE "PO" STATIONARY OIL ENGINE**

The Ingersoll-Rand Type "PO" stationary oil engines are of the horizontal, single cylinder, four-cycle, solid injection design and are built in 50 and 100 b.h.p. sizes. They may be direct connected to electric generator, pump or air compressor, or a flywheel with a 12-in. crowned face, or a special belt pulley may be provided for belt drive. No hot bulbs or hot spots are used in these engines as all parts of head and cylinder are efficiently water cooled.

For horsepower between 104 and 1000 the Type "PR" vertical, multi-cylinder, four-cycle, solid injection oil engine is recommended.

Steam Condensing Plants

Ingersoll-Rand surface condensers are of highly improved design and have many important features not found in other condensers of this type. These I-R condensers have greatly reduced tube surface. Elimination of waste tubes is secured by arranging tubes in stages and by the use of a separate deaerator or cooler. The condenser has a heart shaped shell. Tubes are spaced on wide centers at the top of the shell and brought closer together in each lower bank or stage. This construction compensates for the decreased volume of the steam as it is condensed in its passage down over the tubes, and sufficiently high steam velocities to sweep condensate and air films from the tubes are maintained throughout the condenser.

**INGERSOLL-RAND SURFACE CONDENSER**

The INGERSOLL-RAND COMPANY is prepared to furnish a suitable condenser for all condensing problems and service conditions. Its line includes such types as the low level multi-jet, barometric and surface condensers together with the steam jet vacuum pumps.

Ingersoll-Rand Rock Drills

Ingersoll-Rand rock drills are divided into three main types:

(1) "Jackhamers"—An automatically rotated hammer type rock drill, hand held or mounted, and used in all kinds of general rock drilling and down hole work. There are 5 sizes.

(2) "Stopehamers"—An air feed drill for putting in holes which are 20° above the horizontal. There are 4 sizes.

(3) "Drifter"—A mounted (in shell or cradle) rock drill of heavier design than either of the above, mostly used for drifting or tunnel work. There are 3 sizes.

Other Styles—In addition to the various sizes of the different types of drills mentioned above there are many styles such as wet or dry, with or without anvil block, etc.

There is no one best drill for all work, but INGERSOLL-RAND COMPANY make a type of drill for each rock drilling condition.

"Little Tugger" Portable Hoists

There are many places for this little hoist in all sorts of work. It can be clamped or bolted to any handy support and operated in any position. Either compressed air or steam furnishes power.

The load limit is a half ton and the drum capacity 450 ft. of $\frac{1}{8}$ in. wire rope.

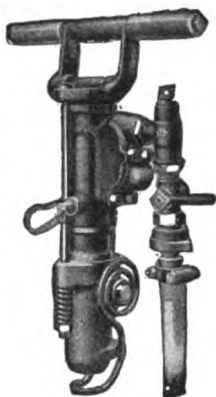
It finds application in handling everything, placing machinery on foundation, skidding heavy crates, hauling cars, hoisting ash buckets, erecting scaffolding, pulling scrapers and backfillers, handling pipe in trenches and a host of kindred jobs. Bulletin No. 4333 for full description.

"Little David" Riveting Hammers

Sturdy, hard hitting tools for every grade of work. Distinctive in design and of superior ability to resist abuse. Can be taken down or assembled in the field—a simple wrench is all that is needed. Built in 5 sizes, with inside and outside triggers, and with or without safety rivet set retainers.

Under equal test conditions, "Little David" riveters will exceed the work of any other hammers of like size. Air consumption is low for the results obtained. Spend more time on the work and less time in the repair shop than any other make of riveters.

Under equal test conditions, "Little David" riveters will exceed the work of any other hammers of like size. Air consumption is low for the results obtained. Spend more time on the work and less time in the repair shop than any other make of riveters.



"JACKHAMER"
ROCK DRILL



"LITTLE TUGGER"
PORTABLE HOIST



No. 0 "LITTLE
DAVID" JAM
RIVETER



No. 60 "LITTLE DAVID"
OPEN HANDLE RIVETER

"LITTLE DAVID" RIVETING HAMMERS

Size No.	Piston stroke, in.	Piston diam., in.	Length exclusive of set, in.	Standard piston, in.	Weight without set, lbs.	Size hose recommended, in.
5	4	1 1/4	14 1/2	3	14	1/2
40	4	1 1/4	14 1/2	2 1/2	14 1/2	1/2
50	5	1 1/4	16 1/2	2 1/2	18	1/2
60	6	1 1/4	17 1/2	3	20	1/2
80	8	1 1/4	19 1/2	3	22	1/2
90	8	1 1/4	19 1/2	3 1/2	24 1/2	1/2

"LITTLE DAVID" JAM RIVETER

0	4	1 1/4	11 1/2	2 1/2	31	1/2
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"LITTLE DAVID" HOLDERS-ON

2	3	3 1/4	7 1/2		13 1/2	1/2
4	4 1/2	3 1/4	12 1/2		26	1/2
5	4 1/2	3 1/4	12 1/2		25	1/2

"LITTLE DAVID" SCALING AND CHIPPING HAMMERS

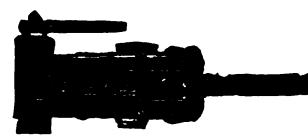
Size No.	Piston stroke, in.	Length over all, in.	Weight, lbs.	Size hose recommended, in.
NO	1 1/4	10 5/8	6 1/4	1/2
NI	1 1/4	10 5/8	7	1/2
1S	1	11 1/4	11 1/4	1/2
2S	2	12 1/4	12 1/4	1/2
2SS	2	12 1/4	12 1/4	1/2
3S	3	13 1/4	13	1/2
4S	4	14 1/4	13 1/4	1/2
5	4	14 1/4	14 1/4	1/2
3R	3	13 1/4	13	1/2
4R	4	14 1/4	14	1/2
5R	4	14 1/4	14 1/4	1/2

"Little David" Drills and Wood Borers

Simple, pneumatic tools for drilling, reaming, tapping in metal, running down lag screws, tightening bolts and boring in wood. Built in 29 sizes and gearing combinations—a tool for every grade of work.



No. 2S "LITTLE DAVID"
DRILL



No. 9 "LITTLE DAVID" CLOSE
QUARTER DRILL

"LITTLE DAVID" NON-REVERSIBLE DRILLS

Size No.	Avg. free speed 90 lbs. pressure r.p.m.	Weight, lbs.	Length of feed, in.	Reaming, in.	Standard twist drill will drive, in.	Length over all, in.	Morse taper socket No.	Hose, in.
1B	240	55	5 1/2	2	2 1/4	16	4	1/2
1C	210	55	5 1/2	2 1/2	3	16	4	1/2
1SE	100	68	5 1/2		19 1/2	19 1/2	5	1/2
2	450	41	4 1/2	1	1 1/4	14 1/2	3	1/2
2S	450	43	4 1/2	1	1 1/4	15	4	1/2
2SC	310	43	4 1/2	1 1/4	1 1/4	15	4	1/2
2SE	140	50	4 1/2	1 1/2	2	16 1/2	4	1/2
3	700	24	4 1/2	1 1/4	2 1/2	11 1/2	2	1/2
3S	700	25	4 1/2	1 1/4	2 1/2	12 1/2	3	1/2
3SB	300	26	4 1/2	1	1 1/4	12 1/2	3	1/2
3SC	220	27	4 1/2	1	1 1/4	13 1/2	3	1/2
3AA	900	24	4 1/2	1 1/4	2 1/2	11 1/2	2	1/2
3SAA	900	25	4 1/2	1 1/4	2 1/2	12 1/2	3	1/2
5	900	15	2 1/2		3/8	14 1/2	1	1/2
5A	1500	15	2 1/2		1/2	14 1/2	1	1/2
44	1400-3000	9			3/8 chuck	14 1/2		1/2
6	2000	9			3/8	13 1/2	1	1/2
600	2000	11 1/2			3/8	15	1	1/2

*Extra heavy drilling, reaming and tapping.

"LITTLE DAVID" CLOSE QUARTER DRILLS

9	170	39	3 1/4	2	3	9	4	1/2
19	170	43		2		12 1/2		1/2
8	200	32	2 3/4	1 1/4	1 1/4	8	3	1/2

"LITTLE DAVID" REVERSIBLE DRILLS

11B	240	60	5 1/2	2	2 1/4	16	4	1/2
11C	210	60	5 1/2	2 1/2	3	16	4	1/2
11SE	100	73	5 1/2		19 1/2	19 1/2	5	1/2
22	450	42	4 1/2	1	1 1/4	14 1/2	3	1/2
22S	450	45	4 1/2	1	1 1/4	15	4	1/2
22SC	310	45	4 1/2	1 1/4	1 1/4	15	4	1/2
22SE	140	52	4 1/2	1 1/2	2	16 1/2	4	1/2
33	725	25	4 1/2	1 1/4	2 1/2	11 1/2	2	1/2
33S	725	26	4 1/2	1 1/4	2 1/2	12 1/2	3	1/2
33SB	300	28	4 1/2	1	1 1/4	12 1/2	3	1/2
33SC	225	28	4 1/2	1	1 1/4	13 1/2	3	1/2

*Extra heavy drilling, reaming and tapping.

"LITTLE DAVID" GRINDERS

			Diam. of wheel end of crank shaft, in.		Carries wheels, in.	
7	3000	22	5/8	20 1/2	6x1 1/2	1/2
601	4200	14	1 1/2	18 1/2	4x1 1/2	1/2
602	4200	14	1 1/2	19 1/2	4x1 1/2	1/2

AMERICAN BLOWER COMPANY

DETROIT, MICH.

WORKS: DETROIT, MICH.; TROY, N. Y.; WINDSOR, ONT., CANADIAN SIROCCO CO.

Products

Manufacturers of HEATING, VENTILATING, and AIR CONDITIONING EQUIPMENT.

"Sirocco" Fans and Blowers; "Sirocco" Electric Utility Blower; Steel Pressure Blowers; Multiblade Fans; Universal Blower and Exhauster; Ventura Disc Ventilating Fan; Detroit Tilting Steam Trap; Sirocco Mechanical Draft Fans. "ABC" Vertical, Enclosed, Self-oiling Direct Connected Engines.

Scope of Use

The AMERICAN BLOWER COMPANY'S lines of fans and blowers include types from small office fans to complete ventilating or heating systems for the largest factories and public buildings. Their superiority is proved by their adoption in the world's largest plants.

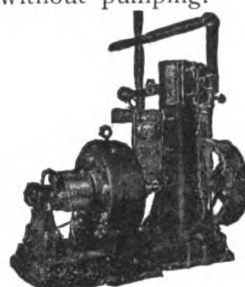
"ABC" fans are adapted to heating, ventilating, exhausting, purifying, cooling, humidifying, dehumidifying and drying equipment in office, public, educational and industrial buildings.

"ABC" Vertical Steam Engine

This engine is of the enclosed, self-oiling type, and is especially adapted for direct connection to fans, centrifugal pumps, stokers, generators, etc. It is high speed and of high efficiency.

Detroit Tilting Steam Trap

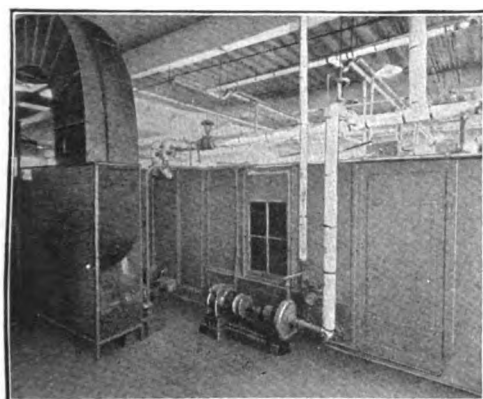
This trap is built in return, separating, vacuum, and condensing types. It is used for automatically returning condensation from steam lines direct to the boiler without pumping.



"ABC" STEAM ENGINE



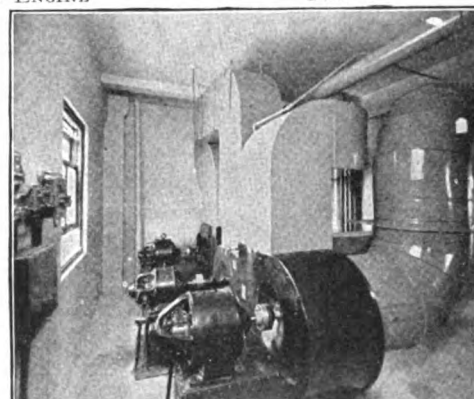
DETROIT TILTING STEAM TRAP



"SIROCCO" SYSTEM OF OFFICE BUILDING HEATING, VENTILATING, PURIFYING AND COOLING



TYPE "P" SPECIAL STEEL PRESSURE BLOWER
For supplying blast to cupolas and furnaces

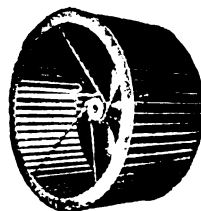


"SIROCCO" FANS USED FOR VENTILATING OFFICE BUILDING

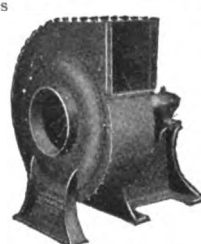


VENTURA DISC VENTILATING FAN

Handles large volumes of air at low power costs



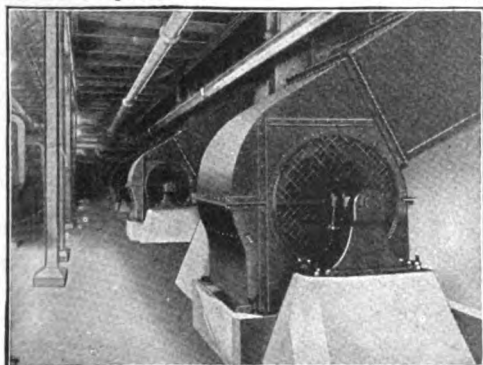
"SIROCCO" MULTI-BLADE PATENTED FAN WHEEL



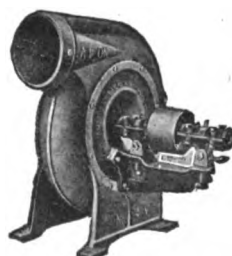
TYPE "E" EXHAUST FAN
For exhausting and conveying systems



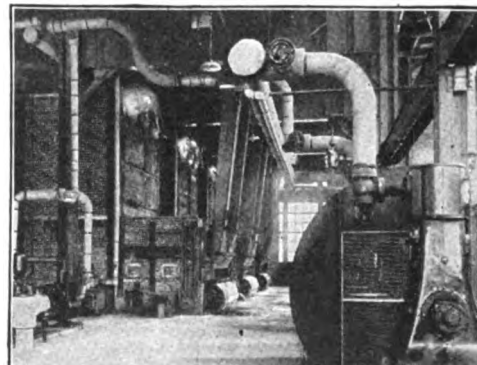
"SIROCCO" ELECTRIC UTILITY BLOWER
Built in three sizes for ordinary lamp socket attachment



"SIROCCO" HIGH SPEED FANS IN LARGE POWER PLANT



TYPE "V" UNIVERSAL BLOWER AND EXHAUSTER



"SIROCCO" MECHANICAL DRAFT FOR AUTOMATIC STOKERS OPERATED BY "ABC" ENGINE

AUTOVENT FAN & BLOWER CO.

FORMERLY BATTERMAN-TRUITT COMPANY

GENERAL OFFICE AND WORKS

730-738 West Monroe Street

CHICAGO, ILL.

TELEPHONE

HAYMARKET 7060 (All Departments)

BRANCH OFFICES

BOSTON, MASS., CAIGAN ENGINEERING EQUIPMENT Co., 110 State Street

BUFFALO, N. Y., J. H. BURROUGHS Co., Inc.

CLEVELAND, OHIO, L. B. DEWEY, 508 Fidelity Mortgage Building

COLUMBUS, OHIO, GEO. MCKEEVER Co., 189 E. Long Street

DALLAS, TEX., L. B. GOTTSCHALL, 2002½ Live Oak Street

DETROIT, MICH., MCNAIR ELECTRIC SALES Co., 116 E. Woodbridge Street

INDIANAPOLIS, IND., G. H. BROOKS, 1724 Prospect Street

MILWAUKEE, WIS., C. D. NEWTON, 301 Metropolitan Building

NEW YORK, N. Y., CORTE ENGINEERING Co., 3412 Woolworth Building

OAKLAND, CAL., H. M. THOMAS Co., 708 Oakland Bank of Savings Building.

PEORIA, ILL., KALLISTER & BOHN, 1015 Peoria Life Building

PHILADELPHIA, PA., JOHN A. CALL, 122 North Franklin Street

PITTSBURGH, PA., B. A. GEIER, 230 Fifth Avenue

ST. LOUIS, MO., H. J. WORUS, 122 North Seventh Street

TOLEDO, OHIO, M. C. GRIFFIN, 2940 Broadway

Products

AUTOVENT EXHAUST FANS.

UNIBLADE BLOWERS and

EXHAUSTERS.

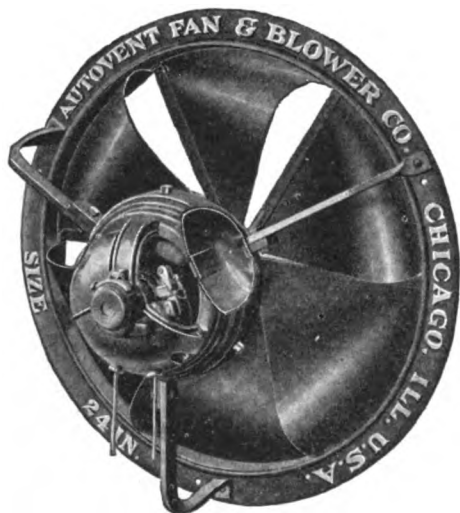
AUTOVENT LOUVERS.



Autovent Exhaust Fans

TRADE-MARK

Designed for exhausting air from kitchens, dining rooms, factories, chemical plants, foundries, etc. A feature of the design is the method of cooling the motor. In ordinary exhaust fans this is accomplished by allowing the air to pass through the motor. This results in rapid deterioration of the motor due to the gases, acids, steam, grease or grit carried in the air. In the Autovent fan the motor is cooled by radiation, all motor parts being protected against moisture, dirt or sediment entering therein. All bearing surfaces are exceptionally large and are well lubricated.



DIRECT CURRENT AUTOVENT EXHAUST FAN
AUTOVENT EXHAUST FANS



ALTERNATING CURRENT AUTOVENT EXHAUST FAN

This cooling system means long life to the motor with high efficiency and reliability, and low maintenance cost.

Autovent exhaust fans consume comparatively little power, operate with unusual quietness, are easily installed, and will run indefinitely at full load under the most trying conditions. Fans can be equipped with safety guards.

All fans and motors are covered by a rigid guarantee.

Autovent Louvers

Especially designed to prevent back draft and provide weather protection to fan openings when the fan is not running. They consist of a number of semicircular vanes connected together in series. The louver opens automatically when the fan is turned on and closes when the fan is turned off. Vanes are of galvanized iron and all working parts are of brass. Made in sizes corresponding to the various sizes of fans.



Closed



Open

AUTOVENT LOUVER

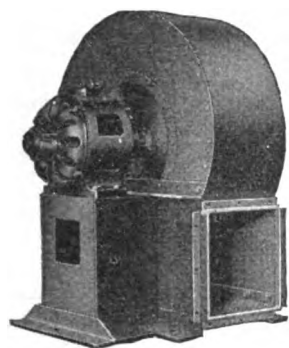
Direct Current				Alternating Current							
				Single phase				Multiphase			
Diam., in.	Cu. ft. air per min.	Watts cons. per hour	R.p. m.	Diam., in.	Cu. ft. air per min.	Watts cons. per hour	R.p. m.	Diam., in.	Cu. ft. air per min.	Watts cons. per hour	R.p. m.
12 WR	1150	65	1700	12 QR	1150	65	1700	18 PR	3300	175	1150
16 WR	1700	95	1250	16 QR	1600	90	1200	20 PN	3800	180	860
18 WR	2600	115	1025	18 QR	3300	165	1150	20 PR	4500	195	1150
20 WR	3300	165	1160	20 QR	4500	195	1150	24 PN	5800	235	690
24 WR	6500	284	830	24 QN	5800	235	690	24 PR	7100	285	860
24 WR	7500	425	900	24 QR	7100	285	860	30 PN	7700	325	570
30 WR	9100	458	690	30 QN	7700	325	570	30 PR	9100	465	690
30 WR	11400	500	825	30 QR	9100	465	690	36 PN	10150	530	495
36 WR	12600	575	600	36 SC	12200	615	600	36 PR	12200	615	575
36 WR	15000	780	725					42 PR	17800	830	495
42 WR	17800	875	500					48 PR	26450	1415	495
48 WR	24000	1330	460					54 PR	28700	1740	410
54 WR	29000	1720	410					60 PR	38500	2140	360
60 WR	34400	2325	375					72 PR	48200	2840	285
72 WR	45000	2900	275								

Type N fans not furnished for vertical operation.

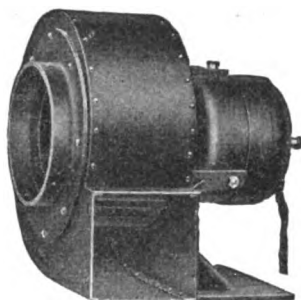
36-in. SC fan is either for constant speed or variable speed operation.

Uniblade Blowers

For supplying air for the ventilation of schools, theaters, churches, lodge halls, dining rooms, office buildings, factories, public buildings, etc.



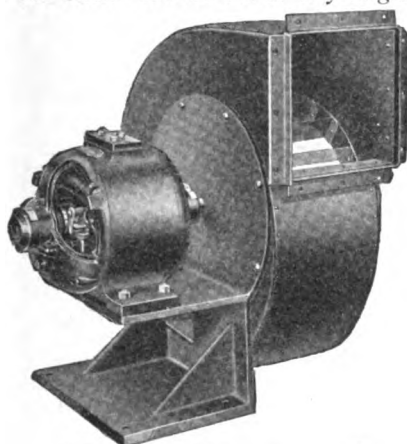
Type A



Type B

UNIBLADE MOTOR DRIVEN BLOWERS

Blowers are made for either motor drive or pulley drive, and the outlet can be set at any angle. The pul-



TYPE C UNIBLADE MOTOR DRIVEN BLOWER

UNIBLADE MOTOR DRIVEN FANS

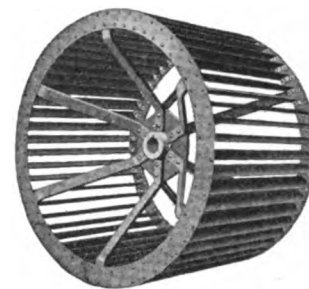
Fan No.	Wheel diam., in.	Static press., in. W.G.	Direct Current				Alternating Current			
			Cu. ft. A.p.m.	R.p.m.	Watts input	Approx. ship'g wt., lbs.	Cu. ft. A.p.m.	R.p.m.	Watts input	Approx. ship'g wt., lbs.
2	12 1/4	3/4	1050	850	186	200	700	575	105	200
	12 1/2	3/4	1200	975	210	240	850	690	145	200
	12 3/4	3/4	1400	1150	240	340	1050	850	186	250
	12 1/2	1.0	1650	1400	450	400	1250	1150	240	300
2 1/2	15 3/8	3/4	1500	658	250	375	1250	575	186	360
	15 1/2	3/4	1775	810	275	375	1500	690	250	360
	15 3/4	3/4	2000	935	465	400	1750	860	445	390
	15 1/2	1.0	2200	1100	625	525	2400	1150	700	410
3	18 3/8	3/4	2100	560	267	400	2350	575	287	425
	18 1/2	3/4	2450	675	432	425	2760	690	440	425
	18 3/4	3/4	2950	775	620	425	3200	850	777	450
	18 1/2	1.0	3400	925	830	475	3800	1150	1450	470
3 1/2	21 3/8	3/4	2900	475	350	500	2900	475	385	485
	21 1/2	3/4	3450	575	625	500	3560	575	625	485
	21 3/4	3/4	3900	675	756	550	4000	690	800	530
	21 1/2	1.0	4150	780	1150	550	4500	860	1400	570
4	25	3/4	3700	420	482	575	3800	425	490	600
	25 1/2	3/4	4500	510	800	650	4300	475	765	625
	25 3/4	3/4	5200	584	1145	650	5100	575	1125	640
	25	1.0	5500	670	1730	700	5750	690	1860	640
4 1/2	28 1/2	3/4	4600	375	630	725	4600	360	600	700
	28 1/4	3/4	5900	450	1025	725	5500	425	975	700
	28 1/2	3/4	6500	520	1400	800	6300	475	1250	775
	28 1/2	1.0	7400	600	2000	850	7800	575	1950	775
5	31 1/4	3/4	5800	335	950	900	5900	310	1030	810
	31 1/2	3/4	7200	410	1280	900	7400	425	1325	850
	31 3/4	3/4	8150	475	2100	900	8150	475	2100	890
	31 1/4	1.0	8700	525	2425	1100	9200	575	2500	1050
5 1/2	34 3/8	3/4	7250	310	1150	1200	6600	285	1050	1125
	34 1/2	3/4	8100	370	1770	1250	8000	360	1875	1125
	34 3/4	3/4	9700	425	2250	1250	9700	425	2200	1200
	34 1/2	1.0	10400	475	2730	1375	10400	475	2730	1200
6	37 1/4	3/4	8600	280	1100	1600	8700	285	1200	1400
	37 1/2	3/4	10400	340	1850	1600	10400	340	1850	1400
	37 3/4	3/4	11500	390	2490	1850	11000	360	2380	1650
	37 1/2	1.0	12600	435	3500	2150	12000	425	3400	1900

ley driven type is designed to handle large volumes of air at comparatively low speeds. The motor driven type is furnished with either single-phase, multiphase alternating or direct current motor. Speed regulators are furnished with direct current motors.

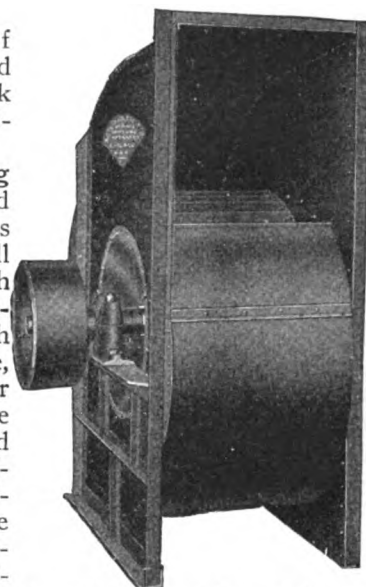
Materials and workmanship are of the best throughout. These blowers are exceptionally quiet in operation at high speeds.

Bearings are of the spherical ball and socket, pillow block type and are self-aligning.

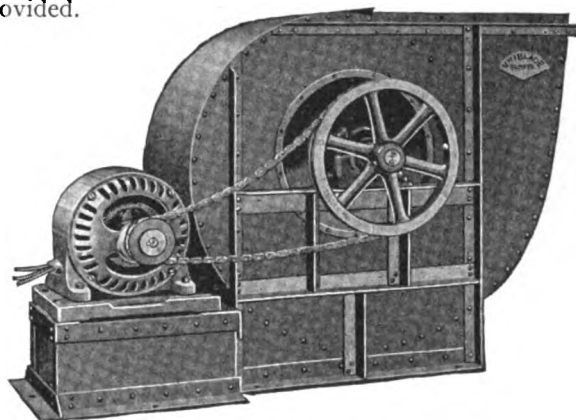
Duplex Oiling System—A patented duplex oiling system is embodied within all bearings, having both combined ring and capillary-wick oilers, which provide two separate, distinct methods for distributing oil to the shaft. Either method will carry and uniformly distribute sufficient oil to keep the bearing properly lubricated. A double oiling system is thus provided.



BLOWER WHEEL



UNIBLADE PULLEY DRIVEN BLOWER



UNIBLADE CHAIN DRIVEN BLOWER

UNIBLADE PULLEY DRIVEN BLOWERS

Size No.	Blast wheel		Static pressures of from 1/4 to 4 in. W. G.			
	Diam., in.	Width, in.	Air capacity, cu. ft. per min.	R.p.m.	Input h. p.	Outlet vel., ft. per min.
2	12 1/4	6 1/4	1470 to 2566	680 to 1477	.25 to 2.75	1900 to 3420
2 1/2	15 3/8	7 1/4	2100 to 3878	527 to 1176	.32 to 3.75	1900 to 3520
3	18 3/8	9 3/8	2940 to 6000	448 to 980	.51 to 5.10	1825 to 3750
3 1/2	21 3/8	11	3920 to 7590	380 to 846	.69 to 6.32	1790 to 3450
4	25	12 1/2	5050 to 10125	336 to 738	.94 to 8.27	1800 to 3570
4 1/2	28 1/2	14	6600 to 12530	306 to 657	1.2 to 9.71	2000 to 3775
5	31 1/4	15 3/8	7840 to 15275	268 to 592	1.31 to 12.8	1900 to 3710
5 1/2	34 3/8	17 1/4	10150 to 17350	248 to 538	1.90 to 14.4	2030 to 3470
6	37 1/4	18 3/4	12000 to 21244	225 to 493	2.26 to 18.7	2040 to 3660
7	43 1/4	22	13643 to 30324	189 to 421	2.74 to 24.8	1664 to 3675
8	50	25	18145 to 37760	165 to 367	3.0 to 26.7	1745 to 3630
9	56 1/4	28 1/4	22300 to 45000	147 to 328	3.72 to 31.2	1700 to 3435
10	62 1/2	31 1/4	27790 to 61950	134 to 295	4.42 to 48.3	1700 to 3800

Catalogue

Copy of our 100-page loose leaf catalogue will be forwarded on request.

BUCKEYE BLOWER COMPANY

COLUMBUS, OHIO

Products

FANS of all types.

Buckeye Disc Fans

Disc fans are recommended for moving large volumes of air at low pressures, but should not be installed with any great length of duct work.

Buckeye disc fans are strongly built, self-contained ventilating units, easily installed and easily moved. Being built with broad overlapping blades they successfully operate against much higher pressure than ordinary disc fans. They are correctly designed and built with the same care as the large centrifugal fans.

BUCKEYE

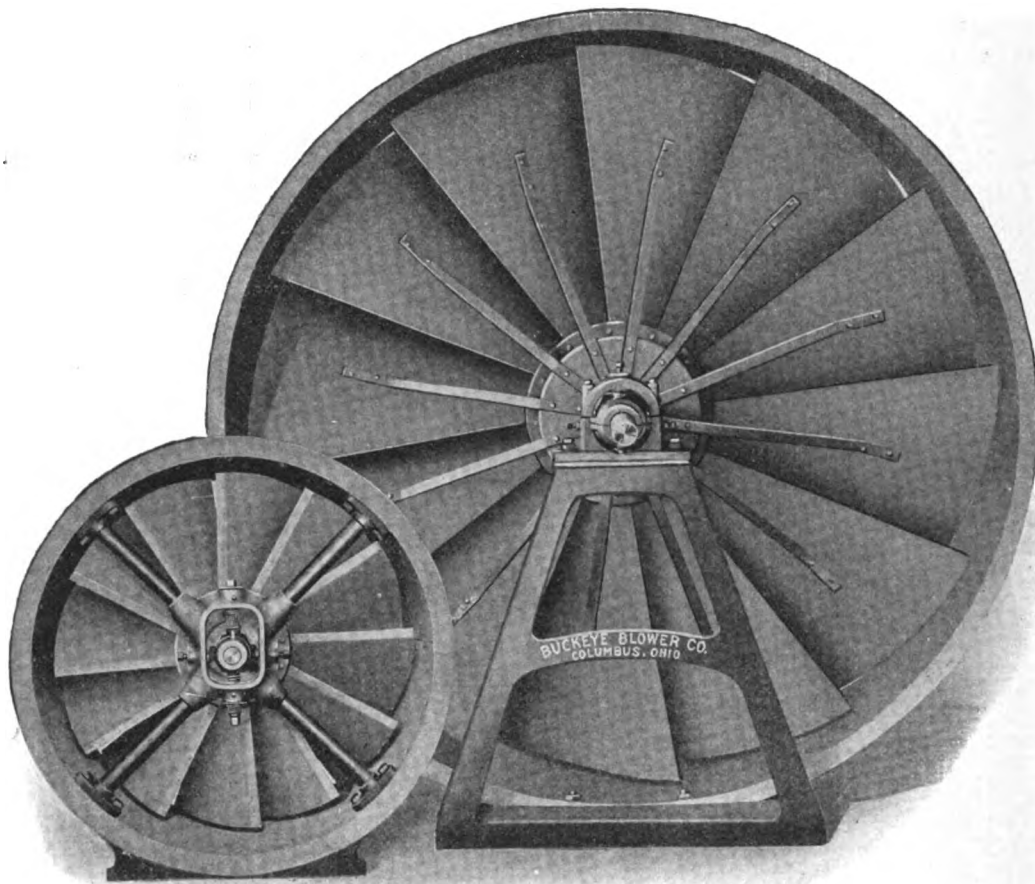
TRADE-MARK

The purchaser has the choice of self-aligning Ilyatt roller bearings; or self-aligning, ring oiled, babbitted bearings, giving a continuous automatic lubrication.

Buckeye disc fans are built to withstand the most severe service in the industrial and mining fields.

Portable direct connected motor driven units, chain or gear drive, are features of Buckeye Service.

Buckeye disc fans are manufactured in quantity under expert supervision and only the best commercial grades of material enter into their construction. They are practically indestructible. No disc fan on the market today compares with these sturdy little ventilating boosters.



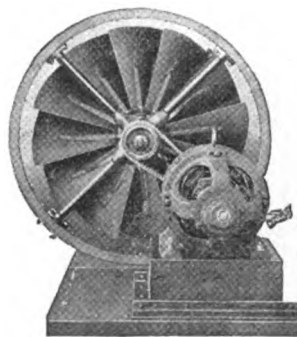
TWO RUGGED TYPES OF BUCKEYE DISC FANS FOR DEPENDABLE SERVICE



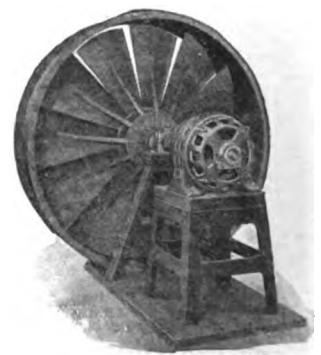
TYPE "A," BELT DRIVE



TYPE "B," BELT DRIVE



TYPE "A," CHAIN DRIVE



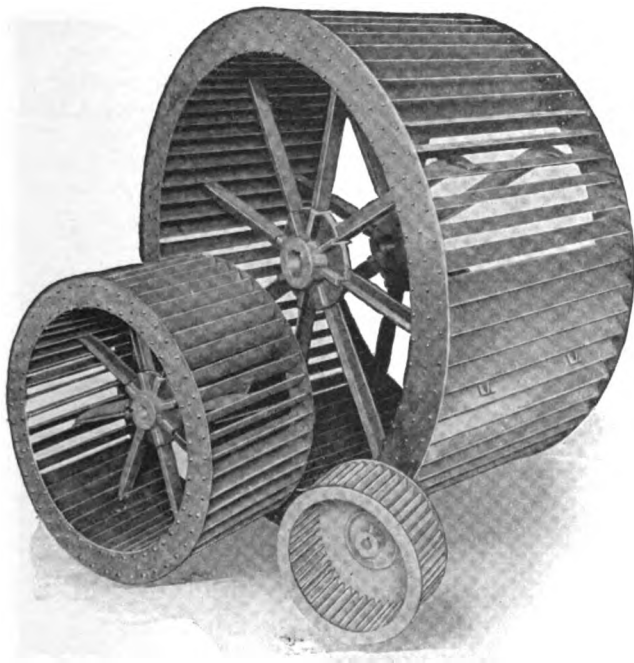
DIRECT MOTOR DRIVE

Buckeye Centrifugal Fans

Buckeye multiblade and steel plate fans are built for general ventilating installations, forced or induced draft, dry kilns and similar service.

Multiblade fan wheels, except in the smallest sizes, are built on steel spiders; this design best adapting itself to a well balanced and reasonably light construction for maximum strength and stiffness. These strong rigid wheels are the secret of the quiet operation of multiblade fans. All wheels are carefully balanced by expert operators on a ball bearing balancing machine before mounting.

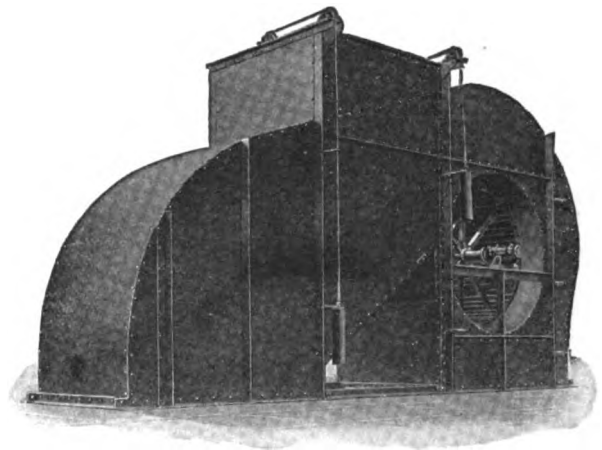
The purchaser has the choice of Hyatt flexible roller bearing pillow blocks of the spherical, self-aligning



BUCKEYE MULTIBLADE FAN WHEELS

type, or the Buckeye ring oiling babbitted bearing of the self-aligning trunnion type. Roller bearings are not recommended for high speeds.

Buckeye centrifugal fans are regularly built with an overhung pulley. The overhung fan wheel assembly for exhaust fans affords easier access to the bearings. For handling hot gases this type of mounting with water cooled bearings is regularly furnished. Direct con-



REVERSIBLE BUCKEYE MULTIBLADE MINE FAN

nected, geared, and chain driven units are special features of Buckeye Service.

Reversible fans for mine ventilation may be changed from blowers to exhausters while running, by swinging a balanced damper. Explosion doors are furnished on these fan housings when desired.

Service

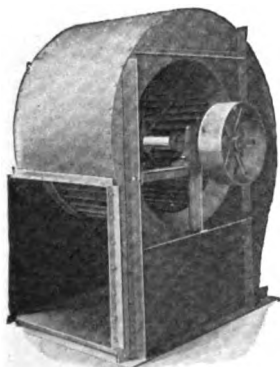
Space is too limited to completely describe or illustrate Buckeye fans. Whatever the problem write our Service Department about it. To enable our engineers to make recommendations on fan installations that will best meet the client's conditions and requirements, the following information is necessary:

- (1) The volume of air the fan is to deliver (both present and future).
- (2) The resistance or static pressure it will operate against; or the length and average size of longest air duct, the number of bends in the air course and the velocity of air required.
- (3) Temperature of air if over 100° Fahr.
- (4) It is also advisable to state:
 - (a) Type of motive power to be used.
 - (b) Any restrictions as to power consumption.
 - (c) Any restrictions as to space for fan or power.

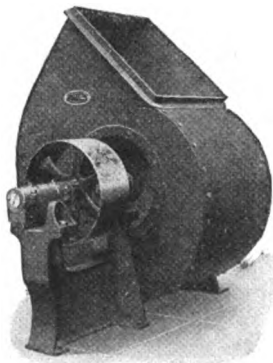
The more clients tell us about their problems, the better our engineers can advise them.

Bulletins

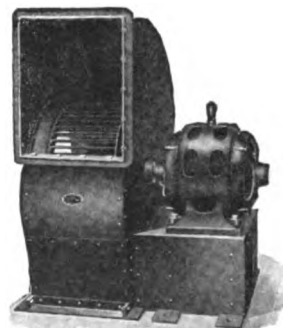
Write for our bulletins. They give complete condensed information on sizes, air capacities, speeds and power consumption. They should be in your files for ready reference.



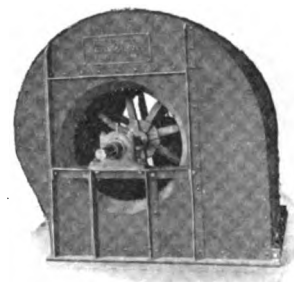
OVERHUNG PULLEY,
BELT DRIVE



OVERHUNG FAN WHEEL,
WATER COOLED BEARINGS



DIRECT MOTOR DRIVE



OVERHUNG PULLEY,
BELT DRIVE

BAYLEY MANUFACTURING CO.

Builders of Heating, Ventilating, Exhausting and Drying Apparatus

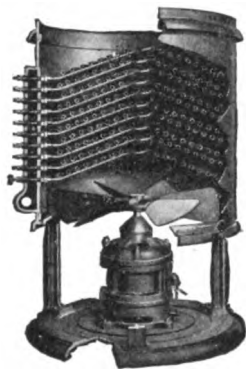
732-748 Greenbush Street
MILWAUKEE, WIS.

Products

UNIT HEATERS; CHINOOK HEATERS; FANS and BLOWERS for all purposes; LEATHER and ALFALFA DRYERS.

Also manufacturers of Steam Engines, Blast Gates and Steam Traps.

B. T. U. Unit Heater



B. T. U. HEATER

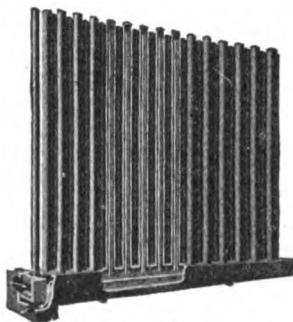
A complete, self-contained heating unit that distributes heat evenly throughout the room by means of an electrically driven fan installed under a series of spiral heating coils as shown in illustration. Operates with greater efficiency than a direct system and with equal efficiency if used as a combined heating and ventilating unit taking part of the circulating air from the outside.

Easily installed or moved from one location to another. Requires only steam and return piping and wiring connections to motor. Ideal for temporary as

well as permanent installations. Requires little floor space.

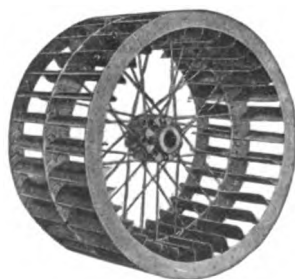
Chinook Heater (Radiator)

A staggered tube, indirect heater built without return bends, elbows, nipples or left-hand threads. Free from the ravages of unequal expansion and contraction, as each tube is a complete radiator in itself. Circulation is established by means of a pipe within a pipe, inside pipe open at the top, outside pipe open at the bottom. Used principally in connection with Plexiform fans for heating and ventilating buildings and for drying purposes; also for direct radiation, cooling water and condensing steam. Can be shipped knocked down to save freight.



CHINOOK HEATER

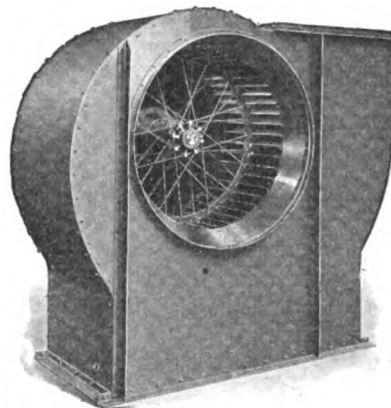
Plexiform Fan



BLAST WHEEL FOR PLEXIFORM FAN

A ventilating unit that is suitable for handling cool or warm air, high and low temperature gases, for all applications where a maximum of air at low or medium pressure is desired and especially where space limitations and power economy are important factors. Free and noiseless in delivery of air without the use of arbitrary cut-offs. Strong and durable

in construction, yet light and compact. Large and practically unobstructed inlet and outlet openings. Made with single or double wheel and with one or more openings in inlet or outlet. Ball or ring oiling bearings.



PLEXIFORM FAN HOUSING

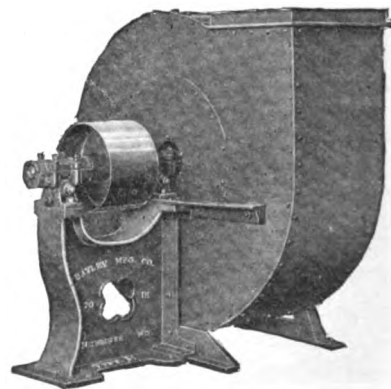
Used principally as a component part of a heating system or a combined heating and ventilating system for schools, public and office buildings; for forced or induced draft systems; drying systems; and for removing dust or gas laden air.

Type B Shavings Exhaust Fan

An exhaust unit for handling refuse from sawmills, planing mills, cotton gins and woodworking establishments. Type B is designed to reach its maximum efficiency at moderate speed. Its outstanding features are in the blast wheel which is made up of an accurately machined balanced center to which the blades are riveted as shown in illustration. This type of construction not only assures perfect balance, but makes replacement of accidentally broken blades a simple matter.



HUB WITH BLADE ATTACHED



TYPE "B" FAN HOUSING

Leather Dryers

Both loft and tunnel systems for drying wet stock, and tunnel systems for re-drying finished leather.

Alfalfa Dryers

A continuous tunnel system for curing alfalfa directly from the mower and delivering the cured hay to the grinder. Also suitable for drying hemp, clover, hops, etc.

BUFFALO FORGE COMPANY

Heating, Ventilating, Exhaust Systems, Drying, Forced and Induced Draft Equipment
BUFFALO, N. Y.

BRANCH OFFICES

NEW YORK, N. Y., 39 Cortlandt Street
CHICAGO, ILL., 562 W. Washington Boulevard
PHILADELPHIA, PA., 1303 Land Title Building
PITTSBURGH, PA., 917 Union Arcade
LOS ANGELES, CAL., 636 H. W. Hellman Building
ST. LOUIS, MO., 515 Chemical Building
BOSTON, MASS., 88 Broad Street

CLEVELAND, OHIO, 368 Kirby Building
MINNEAPOLIS, MINN., 840-846 Builders' Exchange
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PORTLAND, ORE., POWER EQUIPMENT Co., Lewis Building
INDIANAPOLIS, IND., W. C. FLETCHER, 3403 College Avenue

COMPLETE LINE MANUFACTURED IN CANADA BY
CANADIAN BLOWER & FORGE CO., KITCHENER, ONT.

TORONTO, ONT., 1204 Bank of Hamilton Building

MONTREAL, QUE., 702 Southam Building

Products

HEATING and VENTILATING EQUIPMENT:

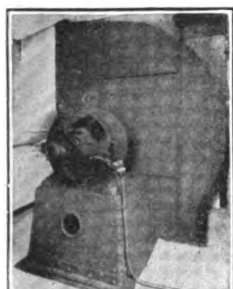
Centrifugal Fans
Heaters, Pipe Coal
and Cast Iron
Exhaust Fans
Disc Fans

Also manufacturers of Forced Draft Fans; Drying Equipment for all materials, etc.
For Machine Tools, etc., see page 868.

EXHAUST SYSTEMS:

Exhaust Fans
Blowers
Dust Collectors

CARRIER AIR WASHERS:
SPRAY NOZZLES.

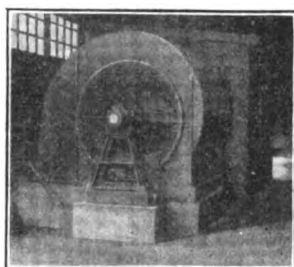


BUFFALO DUPLEX CONOIDAL FAN

Buffalo Heating and Ventilating Equipment

Buffalo Duplex Conoidal Fans—Unequalled for ventilating work. Designed for moderate operating speeds and low outlet velocities in keeping with the best modern practice. High operating efficiency over wide range of capacity. Our engineering department will gladly make recommendations to meet particular ventilating problems.

Buffalo Turbo Conoidal Fans—Particularly designed for stoker fan service. Speeds permit direct connection to steam turbine and electric motor. Constructed to withstand the high operating pressures and continuous service so essential to stoker practice. High operating efficiency over a wide range of capacity in strict keeping with operating range of modern stokers.



BUFFALO TURBO CONOIDAL FAN

Buffalo "B" Volume Blowers and Exhausters

—Used for air pressures up to 6 oz. for blowing forge fires, organ blowing, drying systems, and exhausting gases, noxious fumes, smoke, shavings, chips and any dry material.

Made with one-piece cast iron shell; all air leakage in fan housing is done away with. Our engineering service includes laying out

BUFFALO "B" VOLUME BLOWER AND EXHAUSTER

complete exhaust systems to meet conditions.

SWEET'S CATALOGUE



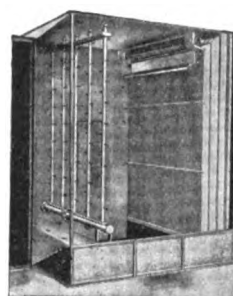
BUFFALO "P.M.X." EXHAUST FANS

Buffalo "P.M.X." Exhaust Fans—For conveying shavings, sawdust, grain, cotton, all sorts of abrasive dust, bark and similar materials. Housings adjustable to either hand and to any angle of discharge. Substantial construction throughout; self-aligning oil ring bearings give long operating life.

Buffalo Disc Fans—For all exhausting and ventilating service where no duct work is required. Will handle large volumes of air against relatively low resistance. Extremely useful in shops, offices, factories to remove foul air, and in dye houses, bleacheries, paper mills and similar plants for removing steam, moist air, dust and odors. Equipped for belt drive or complete with motor. Can be set in sidewall or made with stand to set on floor.



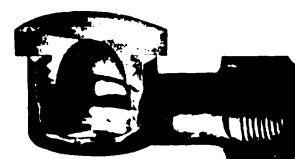
BUFFALO DISC FAN



CARRIER AIR WASHERS

gives maximum contact between air and water spray. Used wherever clean, cool air is required.

Carrier Spray Nozzles—The only non-clogging nozzles made. Simple in construction, consisting of two parts only—body and cap. This nozzle does not depend on the minuteness of its orifice to produce the spray. Interior construction creates intensive whirl of water on leaving nozzle. Produces finest spray at lowest pressures; recommended wherever a soft finely divided spray is desired. Unequalled for paper mills, chemical plants, and similar plants.



CARRIER SPRAY NOZZLE

Catalogues

Complete catalogues on request.

CENTRIFUGAL FAN COMPANY

9-15 Seventeenth Avenue
NEWARK, N. J.

Product

EXHAUST FANS.

"Four Leaf Clover" Exhaust Fans

These fans, which are distinctive in design and construction, comprise the salient points of high efficiency, rigidity and simplicity. They are built in several different types for both vertical and horizontal operation, each type being designed to meet a definite need.

As can be seen from the illustrations, the fan is made up of four patented double roll blades mounted on a flat circular disk. This construction has the advantage, in both the vertical and outside horizontal types, of keeping the motor out of line of the air, gases, fumes, steam, etc., handled by the fan. The same construction

prevents back-draft where horizontal fans are used and insures the continued operation at capacity irrespective of wind direction or velocity.

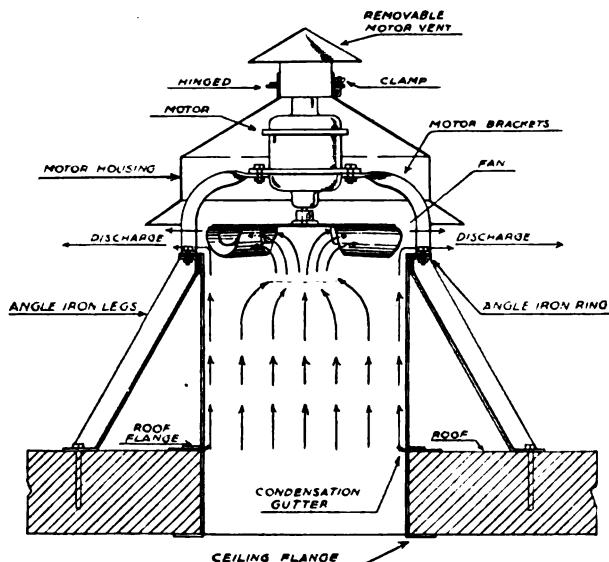
The vertical fan fills the demand for a positive power driven roof fan or ventilator which will produce assured results, irrespective of wind velocity or climatic conditions.

Where horizontal fans are required and the motor must be kept inside the building, the inside horizontal type meets the necessity with not only the other many advantages of this type of fan, but may be supplied with our patented opening and closing device which permits of totally closing the fan aperture by sliding the fan on the shaft until the fan disk comes in contact with the wall flange.



"FOUR LEAF CLOVER" VERTICAL EXHAUST FAN

This overhung construction permits of using a straight pipe, which saves power and enables the 30-in. vertical exhaust fan to operate with maximum efficiency. It is ventilating a restaurant dining room and kitchen.



TYPICAL CONSTRUCTION OF "FOUR LEAF CLOVER" VERTICAL EXHAUST FAN

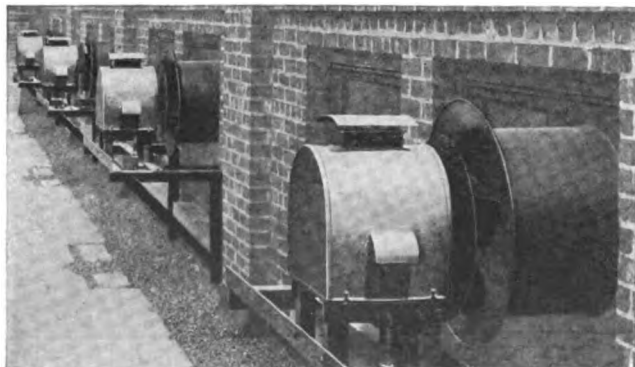
APPROXIMATE OVER-ALL DIMENSIONS OF "FOUR LEAF CLOVER" VERTICAL EXHAUST FANS
(From top of angle iron ring to top of motor housing)

Size fan, in.....	12	18	24	30	36	42	48
Width, in.....	22	30	40	50	60	70	80
Height, in.....	16	20	27	36	40	47	54
Weight, lbs.....	75	120	180	300	400	600	750



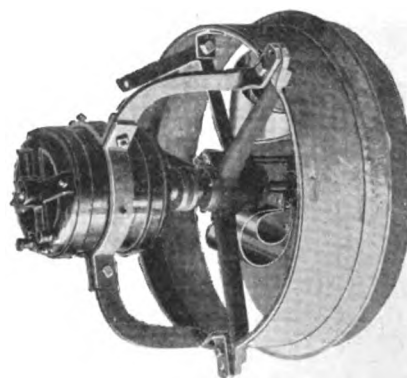
"FOUR LEAF CLOVER" VERTICAL EXHAUST FAN

Method of exhausting impure air from a theater through a window, so that no light is admitted and the factor of noise is eliminated. A 24-in. vertical exhaust fan is used.



"FOUR LEAF CLOVER" OUTSIDE HORIZONTAL EXHAUST FAN

Installation at the Celluloid Co. plant, Newark, N. J.
Four 18-in. horizontal exhaust fans discharging ether fumes. Note how motor is kept out of line of discharge.



"FOUR LEAF CLOVER" INSIDE HORIZONTAL EXHAUST FAN

Equipped with opening and closing device

COPPUS ENGINEERING & EQUIPMENT CO.

Manufacturers of Blowers

340-350 Park Avenue

WORCESTER, MASS.

For Branch Offices, see page 625.

Products

COPPUS VANO BLOWER.

For Centrifugal Turbo Boiler Feed Pumps and Steam Turbines, see page 625.



Coppus Vano Blower

Adaptability—The Coppus Vano blower is a screw-blade propeller blower for either steam or air turbine, electric motor or belt drive, and is adapted for the following uses:

For undergrate or forced draft for hand fired boilers, chain grate, overfeed and underfeed stokers; induced draft; main (and individual room or tunnel) ventilation for mines; air heating and drying installations; cooling of electric motors and generators; ventilation of factories, boiler rooms, ships, tunnels, etc.

Why They Are Different—The Coppus Vano blowers, with a capacity range of 125 to 100,000 cubic feet of air per minute, are operated against pressures up to 8 in. water and, therefore, can be employed where, until now, only centrifugal blowers could be used. Their efficiency runs up to 80%. Power consumption at *constant speed* is practically unaffected by variations in air delivery or pressure.

The stationary guide vane beyond the propeller is of peculiar design. The air current leaving propeller is radially subdivided by individual guide vane blades and taken up by them without shock. The curved guide vane blades, increasing in direction of rotation of propeller, concentrate air current and give it a further acceleration *inside the stationary guide vane*, so as to produce a considerable part of the pressure at this point. The air streams leave the guide vane casing with a slightly rotating motion convergent toward the axis.

Description of the Various Parts—Fan Casing—Of gray iron with a conically shaped outer shell connected by strong integral ribs to inner conical part which forms turbine casing (or motor support) and carries the bearing bushing in which are mounted 2 double row ball bearings, carrying the shaft. Air enters between outer shell and inner cone, drawn in by propeller, *not only parallel to axis* (as with all other propeller blowers), *but also radially at periphery*—an entirely new feature in blower operation.

Motor—The motor, ready assembled, consists of bearing sleeve, with 2 ball bearings, shaft, 2 end enclosures (1 on each side), 2 shaft bushings, 1 complete steam packing box, 3 keys (1 for turbine wheel, 2 for fan), and 2 shaft end nuts. Bearing sleeve is made of gray iron, taper ground on outside to exact size and fits closely in taper reamed hole of conical hub of the fan casing. Sleeve is provided with a flange fastened to finished face of conical hub.

Lubrication—Grease lubrication has been adopted in the Coppus Vano blowers.

Turbine Wheel—Cast of solid bronze. By a patented process, buckets or blades are cast into the wheel, and run as true as if they had been machined. Wheel is carefully balanced.

Buckets are smoothly drawn of non-corrosive alloy which withstands action of steam. Double stage turbine wheels are used. The steam, after passing through first row of blades, is reversed by stationary bucket holding sector and directed into second row of blades, thus giving up its entire energy.

Turbine Cover and Steam Nozzles—The close-grained gray iron turbine cover is provided with an ample steam chamber to which steam supply pipe and an exhaust outlet are connected. Steam chamber communicates through hand operated valves with separate steam pockets or compartments containing sufficient steam nozzles so that full boiler pressure can be used. Nozzles are made of tobin bronze and can be inspected by removing a plug.

The Fan—Cast in one piece with 5 blades arranged in spiral form on a central hub and a supporting ring



VANO BLOWER WITH ELECTRIC MOTOR DRIVE

at periphery. Fan, accurately balanced, is made either of special aluminum alloy of very high tensile strength or of high grade bronze. For highest speeds we use a fan cast of a special aluminum alloy with a heavy ring made of high grade bronze or steel shrunk over supporting ring at periphery of blades. Hub, edges of fan blades and ring at periphery are finished to accurate dimensions, whereas surface of fan blades is hand filed. Rotation is always counter clockwise when facing fan from air inlet.

Guide Vane Casing—Consists of a cast iron shell and hub and 8 spiral sheet iron blades, the ends of which are cast into casing and hub respectively. Entrance section of guide vane casing is same diameter as fan. It first increases slightly and then gradually decreases towards outlet to a diameter smaller than fan. This form is strictly in accordance with flow of air through guide vane casing.

The Diffuser—Attached to flange at outlet of guide vane casing, the diffuser transforms the dynamic into static pressure, its efficiency being in direct proportion to length of diffuser.

Screen—Every blower is provided with a close mesh wire screen at air inlet to prevent accident, as well as entrance of foreign matter into machine.

HERSH BROTHERS COMPANY

SUCCESSORS TO BICALKY FAN CO.

GENERAL OFFICES AND FACTORY

654 Mill Street

ALLENTOWN, PA.

SALES OFFICES IN PRINCIPAL CITIES

Products

Manufacturers of AIR WASHERS; MULTIBLADE FANS; STEEL PLATE FANS; EXHAUST FANS; UNIT HEATERS; MUSHROOM VENTILATORS; BICALKY ROOF FAN VENTILATORS.

Also manufacturers of Blowers and Dust Collectors.



with reference to the hub as to give the greatest strength in the direction of rotation.

Write for catalogue giving capacity tables, horsepower and characteristic curves.

Services

With engineering data unusually complete, we stand ready at all times to assist engineers in the study of their problems. What may seem a complicated problem may be reduced to a simple proposition through the experience of the HERSH BROTHERS COMPANY engineering department.

Do not hesitate to ask for information.

Catalogue

The "Lehigh" catalogue fully describes these products, giving complete tables and all necessary data. Write for a copy.

"Lehigh" Air Washer

This machine is designed for cleansing and cooling air by passing it through a mist-filled chamber. A series of spray heads placed in a vertical plane across the chamber produce the mist.

The construction and mechanical manipulation of this air washer is such that the mist from the spray heads remains intact while flushing. This is of the greatest importance for the reason that it offers no weak spot in the mist sheets during the flushing operations to permit of any foreign matter passing through the air washer.

Multiblade Type Fan

The multiblade fan is particularly designed for use in heating and ventilating systems in public and industrial buildings, where large volumes of air are to be handled at comparatively low pressures. The patented wheel construction is unique among fans, combining as it does the desirable features of the older steel plate fan with the large capacity, efficient and quiet operation of the multiblade type.

The unusual strength and ruggedness of construction are readily apparent from an examination of the blades running at a tangent from the central hub of the wheel. These blades are formed of two heavy bent plates riveted together at the center to form bracing angles on the back of the blade and are so placed

Exhaust Type Fan

This type is constructed especially for shaving exhaust systems in planing mills. The patented wheel construction gives unusual strength and prevents racking. The absence of rivets on the face of the blade insures an unusually long life to the wheel as the rivets otherwise are worn by the abrasive action of the material handled. The construction of the wheel also permits the handling of long, stringy materials without clogging. This type is also constructed as a double fan.

Steel Plate Type Fan

The particular advantage of this type is its adaptability for all purposes. The pressure characteristics adapt it particularly to forced and induced suction in pressure systems where the pressure involved is greater than $1\frac{1}{2}$ to 2 oz. Under such conditions this type is preferable to the multiblade.

The efficiency of the wheel is not affected by high pressures as is the case to a certain extent in the multiblade wheel.

Mine Fans

The Lehigh mine fan is constructed of heavy gauge sheet steel, riveted within two extra heavy angle iron flanges. The housing is heavily braced and securely bolted to the base.

Lehigh Unit Heater

The Lehigh unit heater is a strong sheet steel housing, enclosing a fan and steam coil pipes.

By means of the fan, usually motor driven, the air is taken from the floor, forced over the steam heated coils of the heater and discharged under low pressure through the outlet of the heater.

This provides an economical system of industrial heating—"Puts heat where you want it."

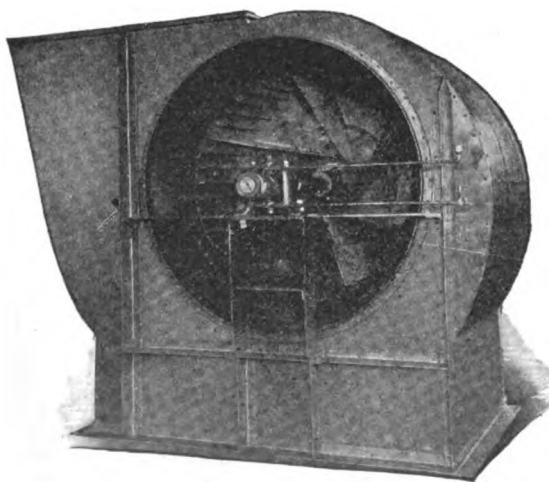
Bicalky Roof Fan Ventilator

Positive ventilation. Wind propelled.

Mushroom Ventilator

Built for either concrete or wooden floors. Efficient and noiseless in operation.

Write for catalogue giving complete data.



MULTIBLADE FAN

ILG ELECTRIC VENTILATING CO.

Fans, Blowers, Exhausters and Unit Heaters

TELEPHONE
KILDARE 1520

2849 North Crawford Avenue

CHICAGO, ILL.

BRANCHES

NEW YORK, N. Y., 13 Park Row

Telephone, Barclay 8787

BOSTON, MASS., TOMPKINS-STODDARD CO., 136 Federal Street

Telephone, Fort Hill 6454

PITTSBURGH, P.A., Bessemer Building

Telephone, Smithfield 1213

PHILADELPHIA, PA., 327 Commercial Trust Building

Telephone, Spruce 2099

CLEVELAND, OHIO, 1314 Schofield Building

Telephone, Main 776

DETROIT, MICH., 203 Owen Building

Telephone, Main 7317

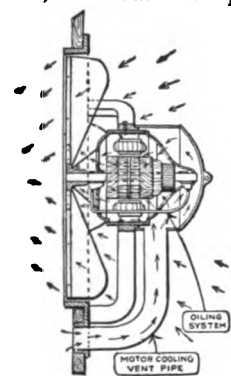
Products

Manufacturers of a complete line of DIRECT CONNECTED ELECTRIC PROPELLER FANS; EXHAUST FANS; HEATING and VENTILATING FANS; AUTOMATIC LOUVERS and SHUTTERS; POWER ROOF VENTILATORS; UNIVERSAL MULTIBLADE BLOWERS and EXHAUSTERS, direct connected and belted; ILGAIR UNIT HEATERS.

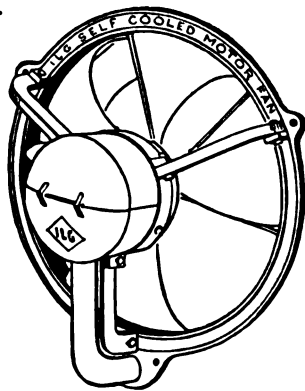
Also manufacturers of Motors for driving fans and blowers; Steel Plate Fans; Ready-to-run Ventilating Sets; Mechanical Draft Apparatus; Fans and Blowers for drying; Humidifiers; Residence Kitchen Ventilators; Farm Barn Power Ventilators.

Ilg Self-cooled Propeller Fans

Furnished with direct connected motor for any current or voltage. Sizes, 12 to 72 in. Capacities, 1000 to 45,000 cu. ft. per minute.



SECTIONAL VIEW



SELF-COOLED MOTOR
PROPELLER FAN

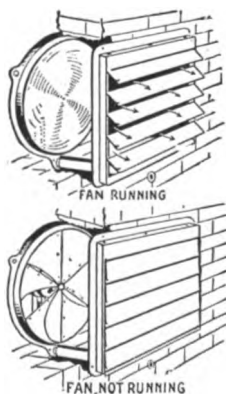
Uses—Used for general exhaust ventilating in industrial plants, restaurants, schools, halls, churches, residences, banks, theaters, stores, public buildings, etc. The self-cooled motor feature makes the fan especially effective in handling gases and extreme heat as high as 400° Fahr.

Ilg Automatic Shutters

Shutters are moistureproof and need no attention after installation.

Built of special hard rolled aluminum leaves pressed on Whitening alloy copper coated rods supported in cast iron frame.

When the fan is running, shutter is held open by the force of the air current. When the fan is shut off, shutter closes automatically by gravity. Furnished in sizes 12 to 72, to correspond with fans of same size. Send for catalogue.

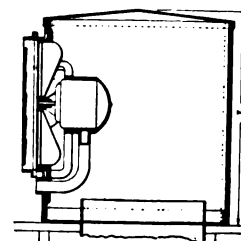
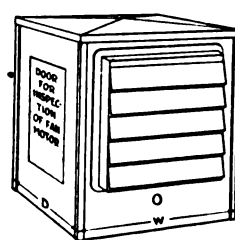


ILG AUTOMATIC
SHUTTER

Ilg Power Roof Ventilators

Comprises Ilg self-cooled motor fan fitted in a penthouse of special construction with an automatic shutter on outside of fan. Used in place of vertical fans and roof ventilators.

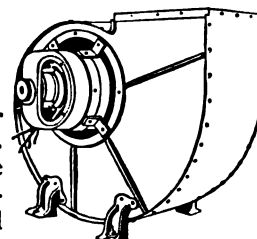
Made in sizes of 18, 20, 24, 30, 36, 42 and 48 in. Catalogue with capacities on request.



DETAILS OF ILG POWER ROOF VENTILATOR

Ilg Universal Multiblade Blowers

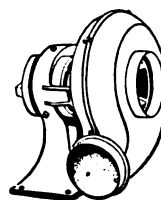
Furnished with direct connected motor or for belt drive. Sizes, 25 to 90 in. single or double width. Capacities varying according to size and pressure. Send for catalogue.



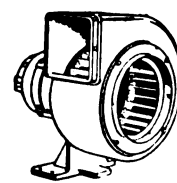
MOTOR SIDE OF ILG
MULTIBLADE BLOWER

Ilg Volume Blowers

Types "V" and "P" used where small volume is required with low or high pressure. Send for catalogue.



Type "P"

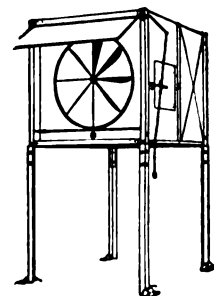


Type "V"

ILG VOLUME BLOWERS

Ilgair Unit Heaters

Used for heating large open spaces in factories, warehouses, garages. Keep heat circulating at floor where it belongs. Furnished in four sizes handling 3000 to 10,000 cu. ft. of air per minute. Ceiling suspension or floor type.



ILGAIR UNIT
HEATER

Catalogue

Write for condensed catalogue showing complete details.

JOHNSON FAN & BLOWER COMPANY

Makers of Ventilating Equipment

TELEPHONE
DEARBORN 1885

115-117 South Clinton Street
CHICAGO, ILL.

Products

BLOWERS; HIGH PRESSURE EXHAUSTERS; EXHAUST FANS.

Also makers of Automatic Shutters, and Unit Heaters.

Design and Construction of Johnson Equipment

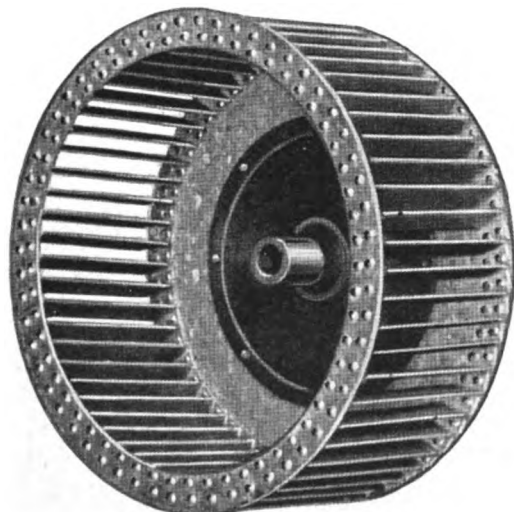
The JOHNSON FAN & BLOWER COMPANY equipment is the result of years of experience, and has been designed and constructed to minimize the cost of installation and maintenance and to give the highest efficiency in operation. All equipment is guaranteed to be free from inherent electrical or mechanical defects.

A large number of standard types and sizes are carried in stock. Special designs can be furnished if the standard equipment does not meet your needs.

Blowers

Johnson blowers are rigidly and simply constructed and can be readily dismantled and assembled. Made for motor or belt drive. Motor driven blowers are furnished for pressures of from $\frac{1}{4}$ to 1 in. water gauge, and with capacities of from 1325 to 17,000 cu. ft. per minute. Belt driven blowers are supplied for pressures of $\frac{1}{4}$ to $1\frac{1}{2}$ in., and with capacities of from 1660 to 34,000 cu. ft. per minute.

Blowers are equipped with the Johnson multiblade wheels, which are designed to produce a large volume of air at low velocity.



JOHNSON MULTIBLADE WHEEL

Forced Draft and High Pressure Exhausters

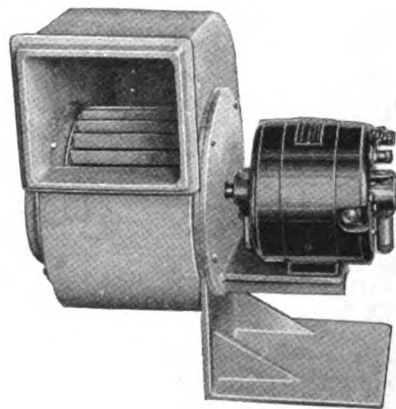
Constructed to meet the most severe requirements. Used for carrying away shavings and sawdust in planing mills; for conveying wool, corks, ashes and other materials by air; for removing gases at high temperatures and for all kinds of forced draft work.

Small Blowers

Made in two types: Pressure blowers and volume blowers, both motor driven.

Pressure Blowers—Made for low volume and high pressures. Suitable for restaurant kitchen ranges, doughnut machines, forges, chemical laboratories, etc. Capacities up to 800 cu. ft. per minute.

Volume Blowers—Made for high volume and low pressure. Suitable for restaurant kitchens, dining rooms, staterooms, small offices, etc. Capacities up to 825 cu. ft. per minute.



SMALL BLOWER—HIGH VOLUME, LOW PRESSURE TYPE

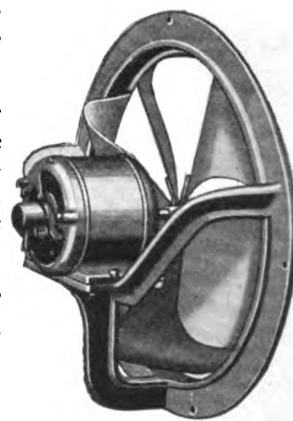
Exhaust Fans

A neatly designed and efficiently constructed exhaust fan, for installation in churches, offices, hotels, clubs, theaters, etc.

The motor is mounted on a pedestal or platform, eliminating thereby the cast iron ring that encircles the motor in the ordinary type of exhaust fan. This design permits of cooling by radiation, instead of by allowing exhaust air to pass through the motor. Motors are enclosed so as to prevent grease, dirt, grit, steam, acid fumes and other gases from getting into the windings and causing burn-outs and deterioration. Special attention has been given to the design of bearings and lubrication.

Made in sizes from 12 to 72 in. in diameter with capacities of from 1200 to 48,000 cu. ft. per minute.

Also furnished with motor on extended shaft, and for pulley drive.



JOHNSON TYPE EXHAUST FAN

Service

The JOHNSON FAN & BLOWER COMPANY is prepared to give engineering advice concerning ventilating problems.

Catalogues sent on request.

ROBINSON VENTILATING COMPANY

Manufacturers of Blowers, Fans, and Steel Plate Construction

6027 Jenkins Arcade
PITTSBURGH, PA.

WORKS: HARMONY PA.

Products

ROBINSON TURBINE FANS; ROBINSON DISC FANS;
BLOWERS; STEEL PLATE CONSTRUCTION, Riveted and
Welded.

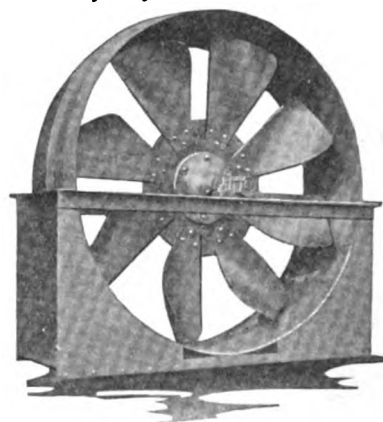
Robinson Turbine Fans

The Robinson turbine fan, so termed through its marked resemblance to the steam turbine, is the latest development in fans for the ventilation of mines, buildings, powerhouses, cupolas, or for any purpose where economy of space or power is considered. This fan is the result of careful design and long years of experience. As developed in "Robinson" specifications, this model is constructed to stand the strains and racking effect of continuous operation.

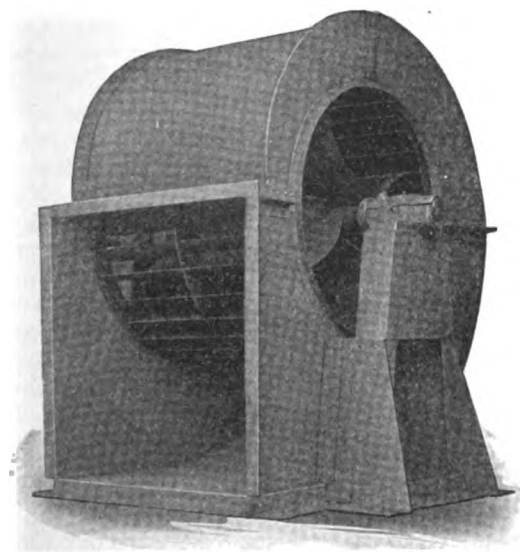
The manner in which the runner or rotating unit is constructed is of particular importance. The vanes or

cular web plate, which is, in turn riveted to a cone casting. This cone is securely keyed to the shaft.

By reason of its heavy construction, this fan has a long life without repair. Due to the proper curvature of the blades, the maximum flow of air is obtained with a minimum of power expended. Made in sizes from 2 to 10 ft. in diameter. Regular equipment is ring oiler bearings. No pulleys are furnished unless ordered separately.



DISC FAN



TURBINE FAN

blades are curved to pass the air through the fan in a natural spiral, effecting a right angle change in the direction of the current with the least possible friction, resulting in saving of power.

The bearings are the latest design of ring oilers or grease bearings with compression grease cups. The Robinson turbine fan has the highest volumetric capacity, manometric capacity, and mechanical efficiency, and is made to specifications in any desired size from 12 in. to 25 ft. in diameter.

Robinson Disc Fans

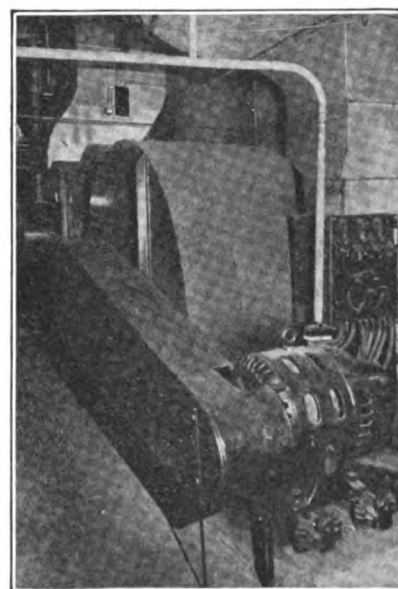
Robinson conical flow disc fans are built very substantially. The blades being securely riveted to a cir-

CONICAL FLOW DISC FANS

Size, ft.	1/4-in. water gage			1/2-in. water gage			3/4-in. water gage			1-in. water gage			Weight lbs.
	Capacity, cu. ft. per min.	R. p. m.	Brake h. p.	Capacity, cu. ft. per min.	R. p. m.	Brake h. p.	Capacity, cu. ft. per min.	R. p. m.	Brake h. p.	Capacity, cu. ft. per min.	R. p. m.	Brake h. p.	
3	6000	450	.5	9000	700	2.2	11000	800	4.0	13000	900	6.0	350
4	11000	350	1.4	16000	500	4.0	20000	600	7.5	23000	700	11.0	600
5	17000	275	2.2	25000	400	6.0	30000	480	11.5	35000	580	17.0	850
6	25000	230	3.0	35000	330	8.5	45000	400	16.0	50000	480	25.0	1100
7	35000	200	4.0	50000	280	12.0	60000	340	22.0	70000	400	35.0	1400
8	45000	170	5.0	65000	250	16.0	80000	300	30.0	90000	350	45.0	1800

Steel Plate Construction

The steel plate construction section of our plant is fully equipped to build gear guards, exhaust heads, or anything in riveted or welded work from No. 18 gauge sheets to 1/4-in. plates. Tank steel sheets of a high grade are used in this work which is specially built to meet the various requirements.



STEEL PLATE WORK

THE SPENCER TURBINE CO.

Manufacturers of Turbine Blowers and Exhausters

HARTFORD, CONN.

SALES REPRESENTATIVES IN ALL PRINCIPAL CITIES

Products

TURBINE BLOWERS and EXHAUSTERS: Spencer Turbo-compressors, Spencer Vacuum Cleaners, Spencer Organ Blowing Apparatus (the Orgoblo).

Turbo-compressors

Spencer turbo-compressors are built to meet the needs of modern industrial conditions frequently requiring continuous operation for many days where absolute dependability is most essential. They are built for service and combine simplicity and practicality with sturdy and rugged construction.

Construction—The Spencer plate steel, double wall, reinforced construction gives a maximum of strength with a minimum of weight.

Foundation—As the motor and compressor form one compact and integral unit no special foundation is required.

Bearings—Consist of 2 motor bearings and 1 ball thrust bearing designed with a liberal factor of safety.

Motors—Of the highest grade, standard type. Spencer turbo-compressors are furnished equipped with 60-cycle alternating current or direct current motors of any standard voltage.

Operation—Spencer turbo-compressors operate at 1750 r. p. m., generally considered by electrical engineers to be the most efficient and practical motor speed, and this one feature has obtained for them rapidly increasing recognition and preference over others.

Special Features—(1) A slow speed, low velocity wide clearance multistage turbine.

(2) Retains its efficiency permanently; no contacts or even close clearances, hence no chance for wear.

(3) Direct connected, self-contained unit, avoids

necessity for belts, gears or chains, with their resultant losses and noises.

(4) Constant pressure, with no pulsations or surging, even when operated idle or under partial loads.

(5) Current consumption inherently decreases in proportion to reduction of volume of air used, eliminating all auxiliary governors.

Pressures—The Spencer line of turbo-compressors for 1-lb., 1½-lb. and 2-lb. pressures meets a wide demand for an efficient equipment of the "slow-speed" turbine type to use in supplying air for oil and gas burning furnaces, foundry cupolas, etc.

CAPACITIES, SPENCER TURBO-COMPRESSORS

1-LB. PRESSURE		1½-LB. PRESSURE		2-LB. PRESSURE	
Catalogue No.	Volume, cu. ft. per min.	Catalogue No.	Volume, cu. ft. per min.	Catalogue No.	Volume, cu. ft. per min.
1005	600	1507	675	2010	600
1007	1000	1510	900	2015	1000
1010	1300	1515	1350	2020	1300
1015	2000	1520	1800	2025	1650
1020	2700	1525	2250	2030	2000
1025	3350	1530	2700	2035	2350
1030	4000	1535	3150	2040	2700
1035	4700	1540	3600	2050	3350
1040	5400	1550	4500	2060	4000
1050	6750	1560	5400	2075	5000
1060	8100	1575	6750	20100	6700
1075	10000	15100	9000	20125	8100
				20150	10000

Data regarding smaller sizes and other pressures furnished on request.

Spencer Vacuum Cleaners

Turbine, or multistage fan type exhausters, of the wide clearance, constant potential, low velocity type. Motors direct connected; no belts or gears. No water or sewer connections required.

Current consumption varies in direct proportion to work being done, through inherent self-governing characteristics of turbine. Simplicity of design, and high grade construction insures low maintenance cost.

Turbine, with extremely wide clearances, and absolutely no close fitting parts, is ideal type of exhauster for handling dirt-laden air. No cloth bags or screens.

Entire system designed to produce correct air stream conditions, to do universal vacuum cleaning with uniform efficiency, speed and thoroughness.

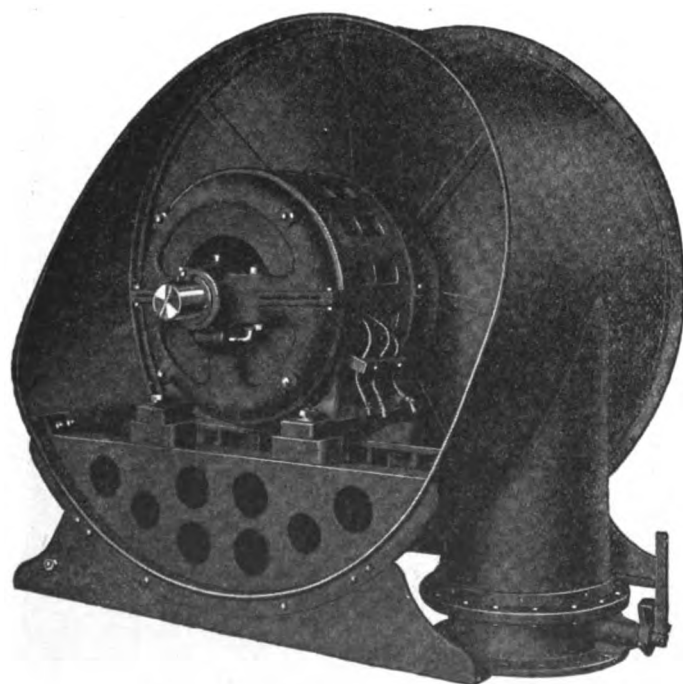
Superiority of cleaning implements and accessories universally acknowledged. All floor tools provided with completely controllable swivel, enabling the operator to reach the dirt with ease and rapidity.

Sizes and Types—Spencer cleaners are manufactured in sizes suitable for all buildings, from smallest residences, to largest skyscrapers, hotels, factories, and business buildings.

Particularly adapted for school buildings. Central plants installed for cleaning entire group of college or similar buildings.

Service—The engineering department is glad to co-operate with engineers or architects in laying out piping systems, drawing specifications or submitting recommendations regarding any vacuum cleaning problems.

References—The finest examples of all kinds of buildings throughout the country are equipped with Spencer systems. Write for list and complete information.



MOTOR END SPENCER TURBO-COMPRESSOR

B. F. STURTEVANT COMPANY

Heating and Ventilating Apparatus and Power Plant Equipment

HYDE PARK, BOSTON, MASS.

BRANCH OFFICES

ATLANTA, GA. CHICAGO, ILL. DALLAS, TEX. KANSAS CITY, MO. PHILADELPHIA, PA. ROCHESTER, N. Y.
 BOSTON, MASS. CINCINNATI, OHIO DETROIT, MICH. MINNEAPOLIS, MINN. PITTSBURGH, PA. ST. LOUIS, MO.
 BUFFALO, N. Y. CLEVELAND, OHIO HARTFORD, CONN. NEW YORK, N. Y. WASHINGTON, D. C.

THE B. F. STURTEVANT COMPANY (INCORPORATED IN CALIFORNIA)

LOS ANGELES, CAL. PORTLAND, ORE. SALT LAKE CITY, UTAH SAN FRANCISCO, CAL. SEATTLE, WASH.

B. F. STURTEVANT COMPANY OF CANADA, LIMITED

GALT, ONT.

MONTREAL, QUE.

TORONTO, ONT.

Products

POWER PLANT EQUIPMENT, including:

FUEL ECONOMIZERS; TURBOVANE FANS for Mechanical Draft; TURBO UNDERGRATE BLOWERS; VERTICAL STEAM ENGINES; STEAM TURBINES.

Also Electric Motors; Turbine, Steam Engine and Gasoline Generating Sets; Generator Cooling Apparatus.

Engineering Service

As each installation is unique, it is usually necessary that an engineer analyze the conditions before making recommendations. The engineering staff of the B. F. STURTEVANT COMPANY has been trained to analyze all conditions and to properly apply the company's apparatus accordingly. Consult this department, without obligation.

Publications

The Sturtevant line is so varied that a comprehensive presentation in one publication is not feasible, therefore a special bulletin is issued on each particular line covering the mechanical details.

Sturtevant Fuel Economizers

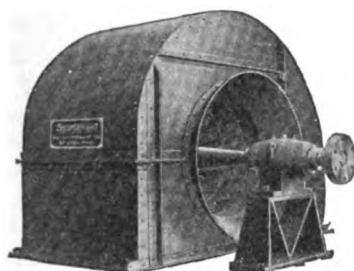
Sturtevant fuel economizers effect large fuel savings, increase the capacity of boilers, prolong their life, purify the feed water and reduce the smoke nuisance. When used in connection with the Sturtevant system of mechanical draft, increased savings may be secured through the burning of the cheapest grades of fuel.

The construction of the Sturtevant economizer is extremely simple.



STURTEVANT FUEL ECONOMIZER

Sturtevant Turbopane Fans for Mechanical Draft



STURTEVANT TURBOVANE FAN

This type of fan was designed for direct connection to either turbines or motors running at their most efficient speeds. Blades have a backward curve which reduces the velocity of air leaving the wheel, consequently the speed is greater for a given pressure.

Fan is so designed that air enters and leaves the wheel with shock loss greatly reduced, which results in increased efficiency and quiet running.

This fan insures absolute protection of its driving unit because of its non-overloading horsepower input curve.

Sturtevant Turbo Undergrate Blowers

Compact, self-contained units designed to secure the advantages of mechanical forced draft without the expense of the larger systems.

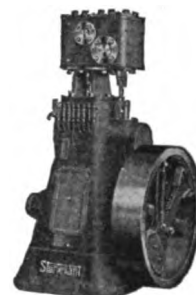
They consist of a specially designed built-up propeller fan, with rolled aluminum blades securely riveted into a bronze hub and mounted on the shaft of a Sturtevant steam turbine. The rotor is a solid forging of the best open hearth steel, with buckets milled into the rim. Nozzles and reversing buckets consist of one solid bronze casting, reversing buckets being milled in the solid metal.

Sturtevant Steam Engines

Vertical engines, VS-7 and VS-8 types, are furnished for use as independent engines and for driving fans, blowers, exhausters and generators direct connected.

They are of the simple, single valve type and may be operated as automatic or throttling engines.

These two types differ only in their oiling arrangements. The VS-7 type has a gravity system and the VS-8 has forced lubrication.



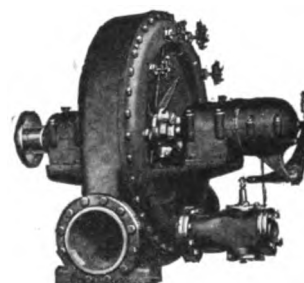
STURTEVANT VERTICAL ENGINE

Sturtevant Steam Turbines

Simple and durable construction makes the Sturtevant steam turbine a reliable source of power for driving fans, blowers, centrifugal pumps and electric generators.

Type 6 is of the single stage, multi-velocity type, and its operation is such as to give high efficiency and permit of moderate rotative speeds. Hand valves are used for shutting off the nozzles, and the speed is regulated by a centrifugal throttling governor placed on the end of the shaft.

Internal lubrication is unnecessary, therefore the exhaust steam is free from oil.



STURTEVANT STEAM TURBINE, TYPE 6

SKINNER BROS. MFG. CO., INC.

Manufacturers of Patent Air Heaters

MAIN OFFICE AND FACTORIES
1434 South Vandeventer Avenue
ST. LOUIS, MO.

EASTERN FACTORY: ELIZABETH, N. J.
BRANCH OFFICES

BOSTON, MASS., 471 Little Building
BUFFALO, N. Y., 728 Morgan Building
CHICAGO, ILL., 1729 Fisher Building
CLEVELAND, OHIO, 638 Marshall Building
DETROIT, MICH., 334 Scherer Building
INDIANAPOLIS, IND., 352 Occidental Building

NEW YORK, N. Y., 1728 Fuller Building
PHILADELPHIA, PA., 629 Otis Building
PITTSBURGH, PA., 34 Wood Street
SAN FRANCISCO, CAL., McAdnocks Block
SPOKANE, WASH., 435 First Avenue
WASHINGTON, D. C., 740 Evans Building

AGENCIES IN ALL PRINCIPAL CITIES

Products

BAETZ PATENT STEAM COIL FAN BLAST HEATER UNITS; SKINNER BROS. PATENTED DIRECT FIRED FAN BLAST HEATER UNITS.

SKINNER BROS. SLOW SPEED DUST COLLECTING SYSTEMS.

Also manufacturers of Exhaust Heads, Exhaust and Blow Piping, Slow Speed Fans, Skinner Bros. Patented Fan Blast Dryer Outfits, Buffing and Emery Wheel Systems.

Baetz Patent Steam Coil Fan Blast Heater

Uses—Adapted for heating and ventilating all types of industrial plants, factories, foundries, garages, moving picture theaters, machine shops and railroad shops.

Also for drying all kinds of materials, fruits, vegetables, candies, etc.

Also for steam-vapor removal in packing plants, paper mill machine and beater rooms, to prevent drippage and excessive moisture.

Advantages—No sheet metal ducts or outside

pipes are used and installation costs are therefore much lower than for other types. Being an individual enclosed unit, the heater is portable and requires no special foundations other than good floor construction carrying 175 lbs. Can be easily installed and connected. Economical



Photo by Underwood & Underwood

FIG. 2. NAVAL HANGAR, LAKEHURST, N. J.
The largest single enclosed building in the world, heated throughout with Baetz Patent Steam Coil Fan Blast Heaters

to operate—even during coldest weather fan need be operated only a few hours morning and afternoon to insure correct inside working temperature throughout the day.

When installed on the killing floor in packing plants, steam and vapor are completely removed; in paper mills drippage is so effectively stopped that the protecting canopies usually suspended over machinery can be entirely omitted.

Sizes and Models—Furnished in 6 sizes and 4 types. Standard equipment consists of all parts shown in Fig. 1 except motor, motor belt and elbow outlet.

Guarantee—When installed and operated as recommended by our Engineering Department, Skinner Bros. Baetz Patent Heaters are guaranteed to deliver absolute satisfaction, or purchase price and shipping charges will be refunded.

Literature—Write for descriptive pamphlet No. 50; list and addresses of users No. 80; catalogue No. 101.

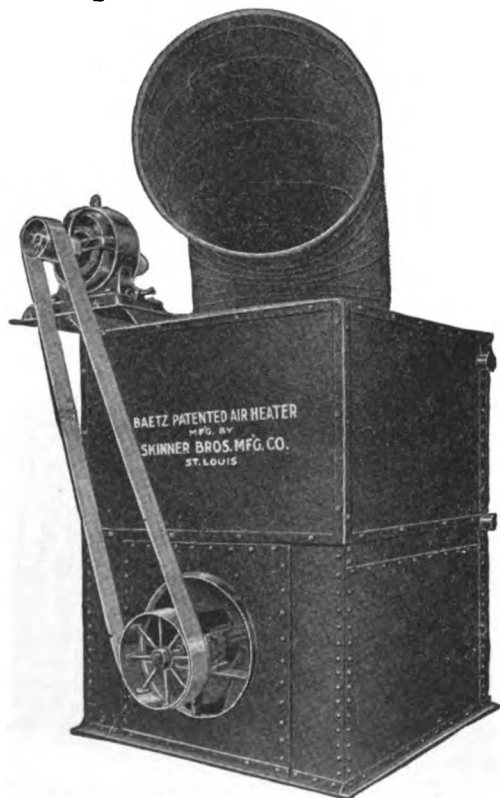


FIG. 1. TYPES OC, NC, OCS AND NCS BAETZ PATENT STEAM COIL FAN BLAST HEATER

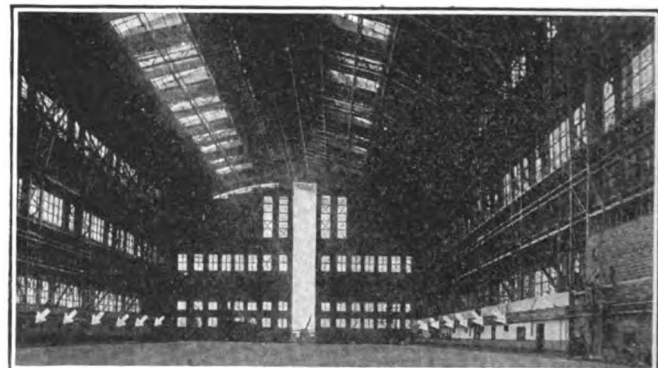


Photo by Underwood & Underwood

FIG. 3. PARTIAL VIEW OF INTERIOR OF LAKEHURST HANGAR
Showing enormous open space served

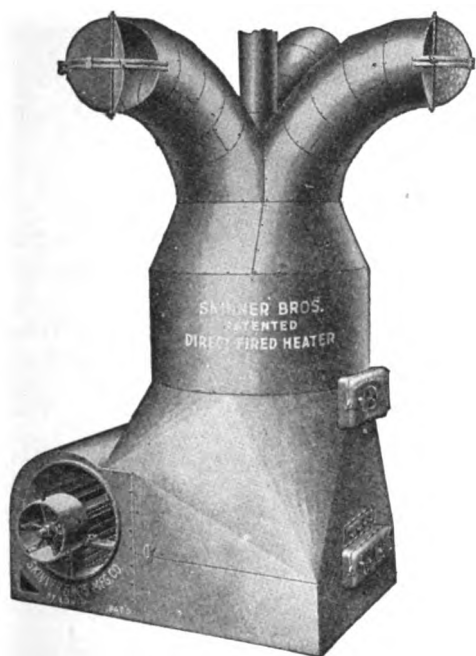


FIG. 4. TYPES DF AND DFS SKINNER BROS. DIRECT FIRED FAN BLAST HEATER

Skinner Bros. Patented Direct Fired Fan Blast Heater Unit

Uses—Adapted for those plants, factories or buildings where steam is not available.

Special Features—The pioneer heating system of its type in America. Contains patented and exclusive features which insure the utmost economies possible with any type of heating system in use. Fitted with special deflector plate mounted over the firing chamber, which in conjunction with new type smoke condenser, provides the maximum heat radiating surface and conserves practically all the heat generated, which is diffused under fan pressure through outlet hoods into the open building space in a manner exactly similar to that described on the preceding page.

Construction and Operation—The direct fired heater consists of a cast iron fire pot fitted externally with patented radiating lugs and mounted over a fan wheel with double air inlets. In operation the cool air at the floor level is drawn into the unit, forced upward and through a warming chamber, surrounding the entire fire pot, and after being thoroughly warmed is discharged at low velocity through the directing elbows at the top.

Fuel—Burns coal, coke, wood, gas or oil and is as convenient to fire as the ordinary furnace.

Standard Equipment—Consists of complete outfit shown in Fig. 4 except directing elbows and smoke pipe. Collar connections for smoke pipe and air directing elbows furnished.

Guarantee—When installed and operated as recommended by our Engineering Department, Skinner Bros. Direct Fired Heaters are guaranteed to deliver absolute satisfaction, or purchase price and shipping charges will be refunded.

Literature—Send for descriptive pamphlet No. 60 with list and addresses of users.

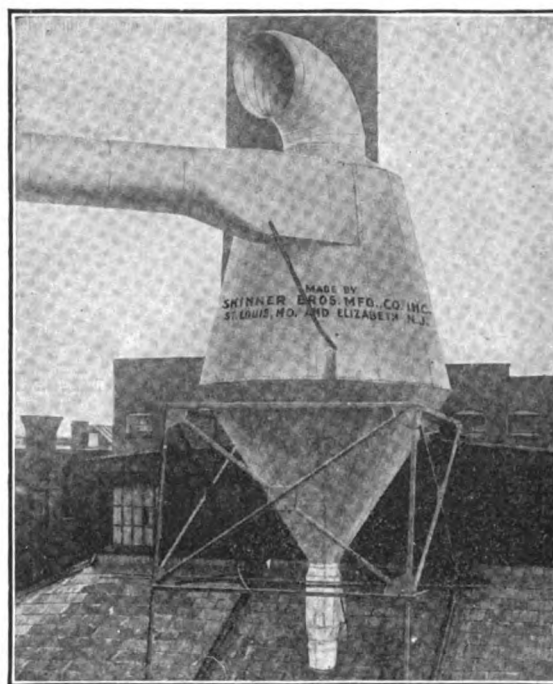


FIG. 5. SKINNER BROS. SLOW SPEED DUST COLLECTOR

Skinner Bros. Slow Speed Dust Collecting Systems

Uses—Adapted for all dust collecting and disposal problems in sawmills, planing mills, box factories, woodworking plants, sanding and finishing rooms, shoe factories, etc.

Design and Construction—Skinner Bros. Dust Collecting Systems are in all cases designed to meet special and individual requirements. Our Engineering Department has had more than 35 years' experience in this particular branch of industry and since hardly two installations are ever alike, it is necessary in each case for our engineers to make special recommendations and layouts in order to insure the most satisfactory operating results.

In many cases it is possible to convert old high speed dust collecting systems to the new slow speed type at a moderate cost and with the assurance of 30% to 40% less power used to produce better and more uniform results throughout the entire system.

Consult our Engineering Department on all dust collecting problems; their recommendations are given without cost or obligation.

Installation—All installations of Skinner Bros. Dust Collecting Systems are made under the personal direction of our own superintendents, whose long experience in laying out and installing dust collecting apparatus has particularly fitted them for this type of work.

Guarantee—Skinner Bros. Dust Collecting Systems are guaranteed to cause no back pressure on the fan and when installed in connection with any fan equipped with an old-style collector, to increase the suction in the main pipes without making any other changes in the piping.

Literature—Send for new descriptive book showing typical installations in many industries, together with complete equipment used in connection therewith.

ROBERT GORDON, INC.

Heating, Ventilating and Automatic Sprinkler Equipment

TELEPHONE
HAYMARKET 3740

1355 West Washington Street
CHICAGO, ILL.

BRANCH OFFICES

NEW YORK, N. Y., 452 Lexington Avenue DETROIT, MICH., Sun Building PITTSBURGH, PA., Bessemer Building

MANUFACTURED IN CANADA by E. J. WOODISON Co., LTD., TORONTO and MONTREAL

Products

Manufacturers of GORDON MECHANICAL HOT BLAST HEATERS; GORDON STEAM UNIT HEATERS.

Also manufacturers of Air Dryers, Air Conditioning Systems.

Designers and constructors of Heating and Ventilating Systems, Automatic Sprinkler Systems, Power Plants, Dryers, Sheet Metal Work and Light Structural Work of all descriptions.

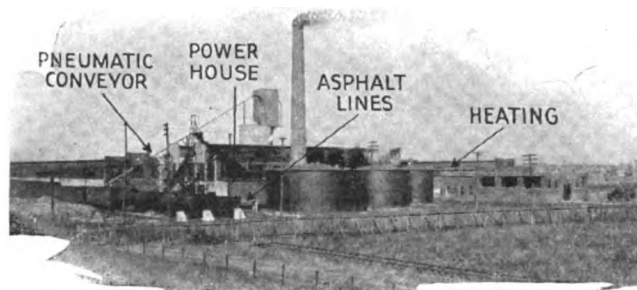
Co-operative Service for Engineers

This company has representatives in practically all parts of the country and will gladly confer with engineers and architects.

An Engineering Department is maintained for the purpose of furnishing, without obligation, technical information and estimates.

Our 30 years' experience enables us to cope with any problem in heating, ventilating, air conditioning, process piping or power plants and achieve its economical solution.

List of representative installations cheerfully furnished on request.



THE HEPPESS-NELSON ROOFING CO.
AUSTIN CO., Engineers

An example of Gordon Engineering service. This installation was made in 60 days. It comprises a power plant, heating system, ventilating system, heating coils for asphalt tanks, steam jacketed tar piping, spiral riveted piping, pneumatic conveying piping—and all sheet metal work in connection.

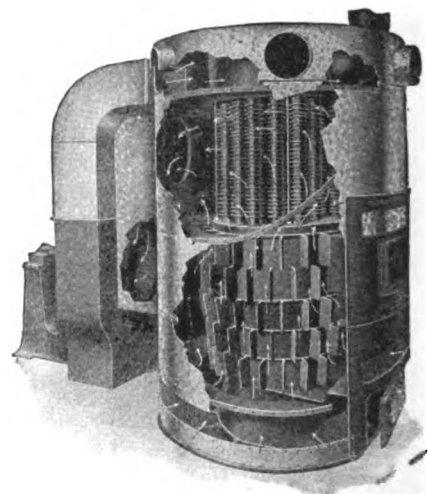
Gordon Mechanical Hot Blast Heater

Adaptability—Designed for heating and ventilating foundries, machinshops, mills and all one-story buildings where direct firing is permissible. ROBERT GORDON, INC. will co-operate with engineers in specifying these units, sizes, etc.

Description—Essentially a large cast iron stove with enormous radiating surface and with a series of heat chambers enclosed in a sheet metal casing. Castings are best grade gray iron. Fan is multivane type.

Advantages—Greatest possible heat delivery from fuel. Gebhardt test establishes it 81% efficient (twice that of other types of heating systems). Staggered fins on combustion chamber, fire pot and radiating

tubes not only break up air, permitting maximum heat absorption, but materially increase radiating surface without increasing fire pot capacity. Multivane fan handles $3\frac{1}{3}$ times as much air per hour as other types. By creating a forced draft through the low intake in the heater and by forcing a tremendous volume of heated air through the upper outlets, this unit accomplishes a complete cycle of circulation in the building—in the working area. Consequently, little heat is wasted and less fuel is consumed. Constantly circulating warm air absorbs and diffuses steam and objectionable gases arising from foundry moulds and processes.



MECHANICAL HOT BLAST HEATER

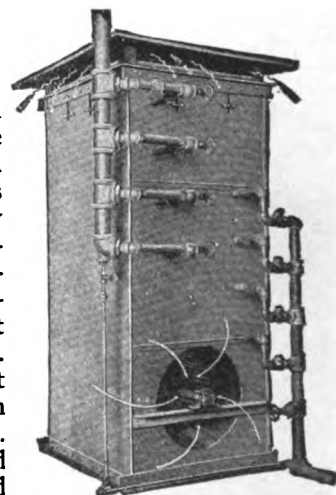
Heating Capacities—75,000 to 500,000 cu. ft. of space per single unit.

Fuel—Any fuel.

Gordon Steam Unit Heater

Adaptability—For heating and ventilating one-story buildings where steam is available or where direct firing is not permissible. Unit capacities, 30,000 to 300,000 cu. ft. of space. Particularly adapted for drying.

Description and Advantages—Four sets of cast iron coils, offsetting each other in parallel. Maximum steam travel, each coil 32 in., making possible greater heat transmission before condensation takes place. Four separate supply valves enable positive temperature control and economy of fuel. Four separate heat outlets permit controllable distribution. Multivane fan gives largest air handling capacity with minimum power cost. Needs only to be connected with supply and return and it is ready to go to work.



STEAM UNIT HEATER

KIRK & BLUM MANUFACTURING CO.

Shavings and Dust Collecting Systems

2900 Spring Grove Avenue
CINCINNATI, OHIO

Products

ENGINEERS and CONTRACTORS for SHAVINGS and DUST COLLECTING SYSTEMS.

Also Economy Adjustable Hoods for Buffing Wheels; Fan Systems for Heating and Ventilating; Air Conveyors.

Dust Collecting Systems

Dust collecting or "blower" systems for shavings and sawdust, leather chips and dust, emery dust, buffing wheel lint, powdered chemicals, etc., all operate on the same general principle.

The power required to produce a given suction throughout any system depends on the total resistance of the system, and the efficiency of the fan or blower.

The resistance of the system is made up of pipe friction, loss at the junctions of the several pipes, and the back pressure of the collector or "cyclone."

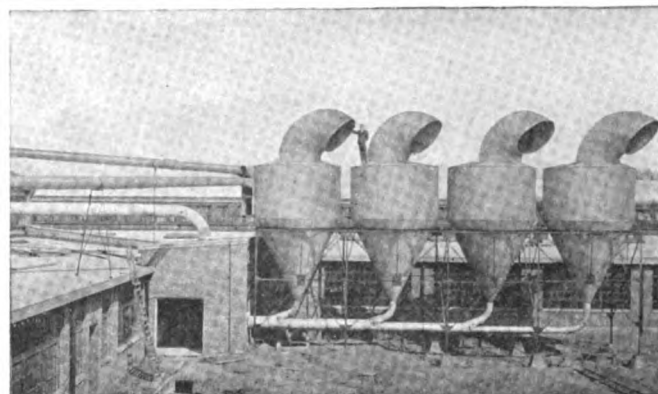
The pipe friction in any make of system is practically a constant factor at given lengths and velocities.

Pipe Junctions—In Kirk & Blum systems the old method of forming pipe junctions by tapering the main, cutting holes in this taper, and attaching tees at an angle of 45°, is supplanted by the modern and efficient "K. & B. fittings."

K. & B. Fittings—These fittings allow the branches to be brought nearly parallel to the mains before uniting them. This eliminates the whirls and eddy currents, abrasion and frictional losses existing in the standard tee still used in other systems.

This elimination of frictional loss at the junctions means that any fan can produce a given suction at less speed and power if K. & B. fittings are used instead of tees.

The patents and patterns of these fittings are controlled by us.



KIRK & BLUM COLLECTORS IN RELAY AT THE GLOBE WERNICKE CO. PLANT, NORWOOD, OHIO

"The Kirk & Blum collector really does save power"

Dust Collector—The dust collector determines to a very large extent the pressure necessary to produce the required suction at the machine hoods.

A dust collector which produces high "back pressure" thus demands correspondingly high speed at the fan and therefore excess power.

The Kirk & Blum dust collector removes "back pressure" and operates successfully on minimum power.

This collector is composed of a cylinder and cone; but unlike any other cyclone, the air outlet at the top is eccentric to the axis, and the cylinder contains a double deflector construction which guides the whirl away from the inlet, eliminating "back pressure."

The University of Michigan has found after 3000 tests that the Kirk & Blum collector is from 27% to 39% more efficient than any other collector.

We control the patents on this collector.

Fans—We are not limited to any make of fan and select the size, type and make best adapted to each installation, and the one which will do the work most efficiently.

Facilities and Experience—Kirk & Blum systems are designed on the best engineering basis, constructed in modern and well equipped shops, and substantially erected by thorough mechanics of long experience.

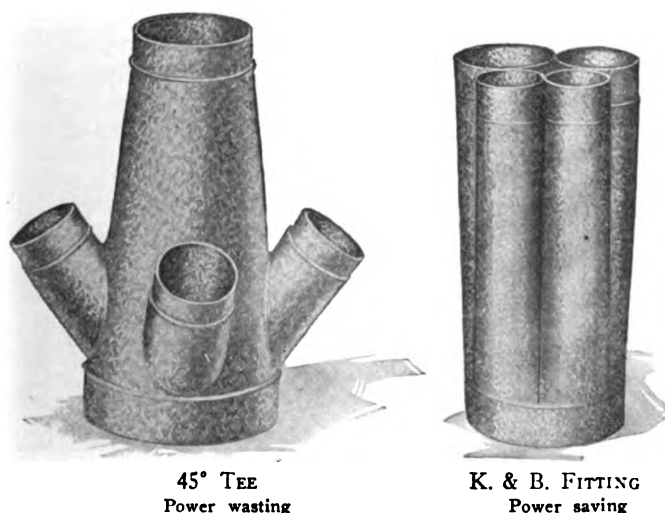
Co-operative Service

Our catalogue giving list of many prominent installations and illustrating a number of systems of various kinds, will be sent on request, or one of our engineers will call on you if desired.

Users

Our systems are used by the following:

National Cash Register Co., Dayton Ohio; International Harvester Co., Springfield, Ohio, and Richmond, Ind.; Worthington Pump and Machinery Co., Cincinnati, Ohio, and Harrison, N. J.; Globe-Wernicke Co., Cincinnati, Ohio; Ford Motor Co., Hamilton, Ohio, and Iron Mountain, Mich.; Dodge Brothers, Detroit, Mich.



45° TEE
Power wasting

K. & B. FITTING
Power saving

ATMOSPHERIC CONDITIONING CORPORATION

441 Chestnut Street
PHILADELPHIA, PA.

GENERAL WESTERN OFFICE: 841 Monadnock Building, CHICAGO, ILL.

TERRITORIAL REPRESENTATIVES

ATLANTA, GA.
PITTSBURGH, PA.
CLEVELAND, OHIO

DETROIT, MICH.
INDIANAPOLIS, IND.
CINCINNATI, OHIO

KANSAS CITY, MO.
OMAHA, NEBR.
DALLAS, TEX.

SEATTLE, WASH.
ST. LOUIS, MO.
MINNEAPOLIS, MINN.

CANADIAN REPRESENTATIVES: DARLING BROTHERS, LTD., MONTREAL, CALGARY, TORONTO, VANCOUVER, OTTAWA, HALIFAX, WINNIPEG

EUROPEAN REPRESENTATIVES: ATMOSPHERIC STEAM HEATING CO., LTD., LONDON, ENG.

Products

EQUIPMENT for maintaining ARTIFICIAL ATMOSPHERIC CONDITIONS in industrial plants: HUMIDIFYING, DEHUMIDIFYING, DRYING, COOLING APPARATUS and AIR CONDITIONING APPARATUS for public buildings, etc., and for generator and transformer ventilation; AIR WASHERS.



Atmospheric Conditioning Apparatus for Industrial Plants

The ATMOSPHERIC CONDITIONING CORPORATION is equipped to design, manufacture and install apparatus for maintaining artificial atmospheric conditions in industrial plants.

Such apparatus becomes essential where it is desired to safeguard the health and increase the efficiency of employees by maintaining normal temperature, removing all dangerous dust particles, fumes, etc., or to protect food products, delicate fabrics, sensitive photographic materials or films, paints, enamels and all goods which undergo deterioration through injurious contact with atmospheric impurities.

The nature of each problem dictates the type and construction of equipment to be installed.

The introduction of moisture and the maintenance of the proper relative humidity are often essential to the perfect working of certain products, and with a Webster humidifier, ideal conditions can be maintained day in and day out, the year around.

Where excessive humidity conditions are dangerous to the success of a given process or objectionable in packing or storage rooms, the Webster dehumidifier will be found equal to any climatic variation.

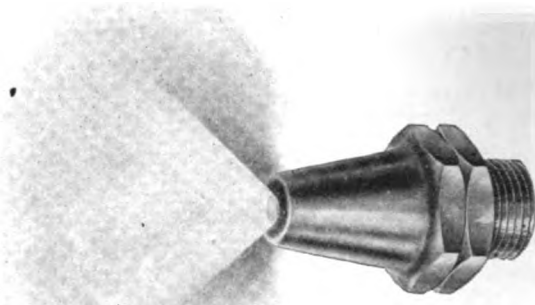
Webster system of automatic humidity control may be applied to the various types of Webster air washers,

humidifiers and dehumidifiers. Perfect in principle and accurate in operation—the chief controlling thermostat subject to water, a medium with four times the specific heat of air.

Humidifiers

The Webster humidifier is designed for use in plants where it is essential to the success and economy of production to add moisture to the air entering through the ventilating system and thereby maintain automatically a uniform relative humidity.

In textile mills, whether the product be of cotton, wool or silk, the necessity of keeping the fabrics moist during the process of manufacture is well known and the item of regain is one of considerable moment.

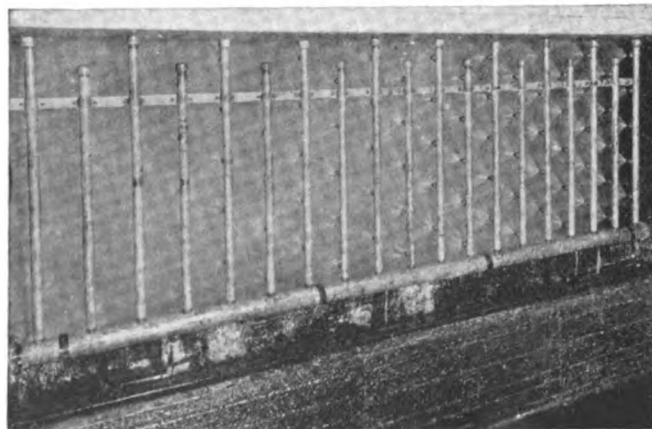


THE WEBSTER SPIRAL MIST NOZZLE (PATENTED)

Not only in the textile field but in any other branch of industry where the addition of moisture is a requisite to constant satisfactory production the Webster humidifier will be found equal to the demand.

Among the advantages gained by the use of the Webster humidifying system, may be mentioned:

- (1) Central location and control of entire humidifying plant.
- (2) Uniform humidity obtainable without the application of direct spray in rooms.
- (3) Humidity may be maintained automatically at any desired point.
- (4) Entering air freed from dust and dirt by washing.
- (5) Lowering of temperature in summer by evaporation, using recirculated water in humidifier.
- (6) Regain may be kept practically constant, assuring uniformity of product.
- (7) Elimination of static electricity.
- (8) Ample ventilation without opening of windows.
- (9) Great economy may be effected during heating season by partial recirculation of air.



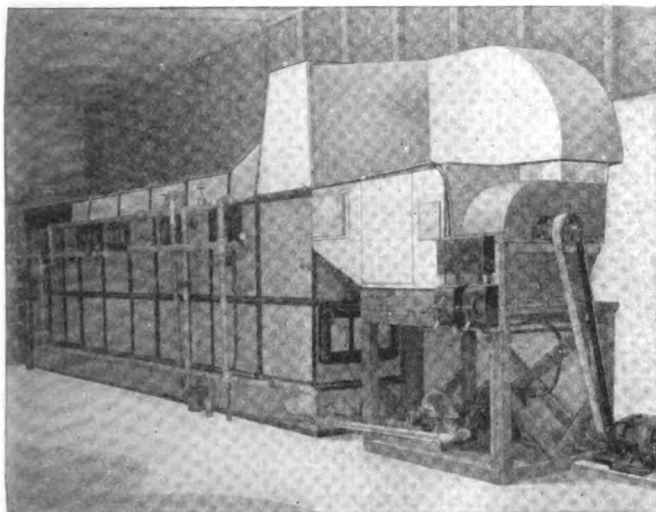
SPRAY CHAMBER OF WEBSTER APPARATUS SHOWING SPRAY NOZZLES IN OPERATION

Dehumidifiers

During the season when high temperature and excessive humidity prevail, the difficulty in working certain materials or the carrying on of certain processes becomes a serious factor and in some lines it has been found necessary to shut down while unfavorable weather conditions continue. It is no longer necessary to suffer such loss or be put to such inconvenience for apparatus is available by which the moisture content of the air can be controlled within 2% of that for which the apparatus is set, at the same time maintaining a temperature within 1° Fahr. of that desired.

The lines of industry in which dehumidifying apparatus can be of advantage are without number.

The manufacture of food products, glue, gelatine, candy, butterine, chemical products, explosives; the growth of mushrooms and other vegetable products, and the cooling of meats in the process of killing, pre-cooling or drying have all come within our experience and we have numerous instances to which the manufacturer can



SPECIAL WEBSTER AIR CONDITIONING APPARATUS IN MUSHROOM PLANT MAINTAINING CONSTANT CONDITIONS THE YEAR AROUND

be referred, where not only very satisfactory but quite remarkable results have been accomplished.

Dehumidifying can be secured in several different ways and we manufacture apparatus of such design as to meet the specific conditions, where the details of the problem are known. Cooling air to the saturation point can be secured by the recirculation of spray water when terminal conditions demand no greater cooling effect. Under certain conditions artesian well water may be necessary and in this class of equipment we manufacture not only single stage but multiple stage apparatus by which the cooling effect of water can be used to the fullest extent. Where greater cooling is necessary than can be secured by either of the above types, the application of refrigeration is resorted to and in this type of equipment the most advanced stage of air conditioning is reached.

Among the advantages to be gained by the use of the Webster dehumidifying system, as compared with earlier methods of cooling and dehumidifying, are:

- (1) Saving in power.
- (2) Economy in space.
- (3) More effective heat transfer.
- (4) Elimination of frosting.
- (5) Elimination of dirt and dust from air by washing.

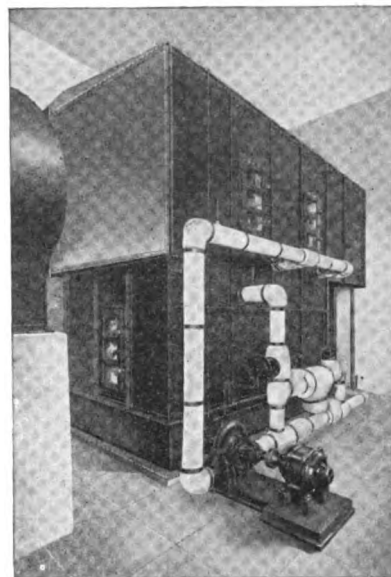
- (6) Greater accuracy of control possible.
- (7) Automatic regulation can readily be secured by a simple scientific control system.

Air Washers

Suitable for practically every type of building for either cleaning or cooling the air or both, for the comfort of the occupants, or to maintain high efficiency among employees or students.

"Type A" air washer is designed primarily for cleansing and cooling where a moderate cooling effect by evaporation is desired. Guaranteed when operating at rated capacity to remove 98% of all solid matter contained in the air, and to cool this air 70% of the wet bulb depression.

"Type B" is designed for cleansing and cooling the air in public buildings and industrial plants, where the greatest possible cooling effect by evaporation is desired.



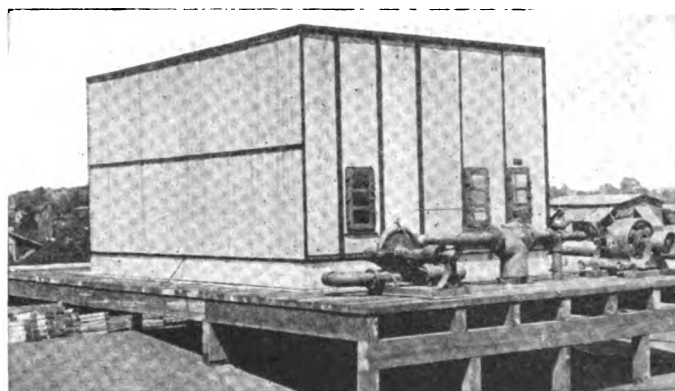
ATMOSPHERIC DEHUMIDIFIER OF REFRIGERATION TYPE INSTALLED IN PLANT MANUFACTURING FOOD PRODUCTS

Webster Air Conditioning Apparatus for Generator and Transformer Ventilation

One of the most important factors in securing maximum output and efficiency of turbo-generators and electric transformers is that the air used for ventilation shall be free from dust, dirt and foreign material, and that it be delivered to the unit at as low a temperature as possible during summer months.

Webster apparatus designed for this purpose is made in two types; that designated as "G.W." is primarily for cleansing, while type "G.C." will deliver air to the generator at the saturation point.

Every installation of air conditioning apparatus for whatever purpose intended must be considered as a separate engineering problem and it is impossible to furnish information here which would apply except as to general results to be secured.



TWO-STAGE WEBSTER WELL WATER DEHUMIDIFIER DURING ERECTION

W. L. FLEISHER & CO., INC.

Consulting and Contracting Industrial Engineers for Air Conditioning and Drying

31 Union Square West

NEW YORK, N. Y.

CHICAGO, ILL., 530 South Clinton Street

PHILADELPHIA, PA., 135 North 3rd Street

Products

AIR CONDITIONING SYSTEMS.

DRYERS FOR LIQUIDS: Spray type.

Air Conditioning Systems

The Sturtevant-Fleisher air conditioning systems cover the whole field of humidifying, de-humidifying, cooling and heating in all their branches.

These systems are based on a combination of the 60 years' engineering and manufacturing experience of the B. F. Sturtevant Co., with the 10 years' industrial engineering and contracting experience of W. L. FLEISHER & Co., Inc.

All Sturtevant-Fleisher air conditioning systems are composed of B. F. Sturtevant Co. apparatus exclusively, and are designed and installed only by W. L. FLEISHER & Co., Inc.

Systems are designed for estimating and installation only after exhaustive tests both in the Sturtevant-Fleisher laboratories and in the factory; all installations are covered by a guarantee to "deliver the climate" which is ideal for the specific product.

A comprehensive engineering and construction organization carries the problem through from the preliminary investigation to complete installation, turning the system over to the client in operation, with guarantees demonstrated.



TRADE-MARKS

Atomizer Nozzles—Patented spraying nozzles are made in a variety of forms, each adapted to product to be atomized. Viscous materials of the nature of glue are atomized by large calibre heat-enveloped nozzles, which minimize clogging.

Dust Arrester—Dry dust arresters are used in all installations and a dust recovery of 98% is guaranteed. Sturtevant dust arresters for the wet method of dust recovery are used where such type of recovery is indicated.

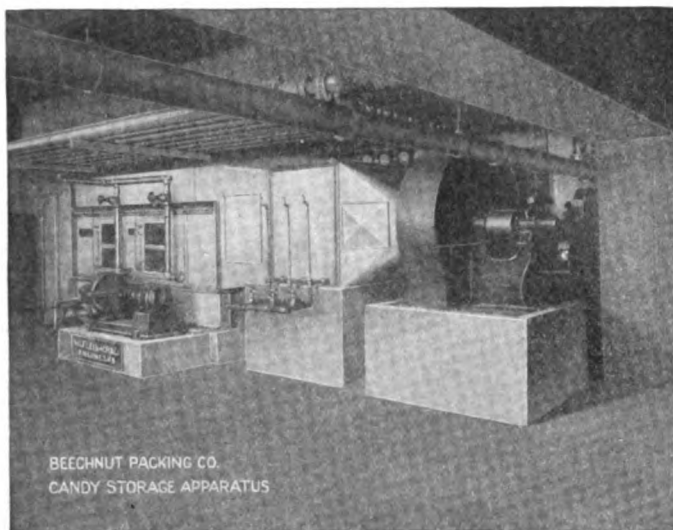
Heater—Air drawn through the drying chamber is warmed by furnace using gas or oil and showing a thermal efficiency close to 100% or, when steam is used, Sturtevant pipe coil heaters are installed.

Exhaust Fan—Extra heavy steel plate Sturtevant exhausters are used in all Fleisher spray dryer installations.

Control—Patented control systems for regulating temperatures and controlling moisture content of air are supplied with each installation.

Drying Temperature—Air at a temperature above 300° Fahr. is introduced into the drying chamber, but actual drying is done at wet bulb temperature which is considerably below this. Such low drying zone temperatures are due to the almost theoretically perfect thermal efficiency of the Fleisher spray dryer.

Flexibility—Any unit of dryer may be added to without interrupting its operation. Not only is the Fleisher spray dryer exceedingly compact, but every installation is designed to fit the space available.



AIR CONDITIONING IN CANDY FACTORY

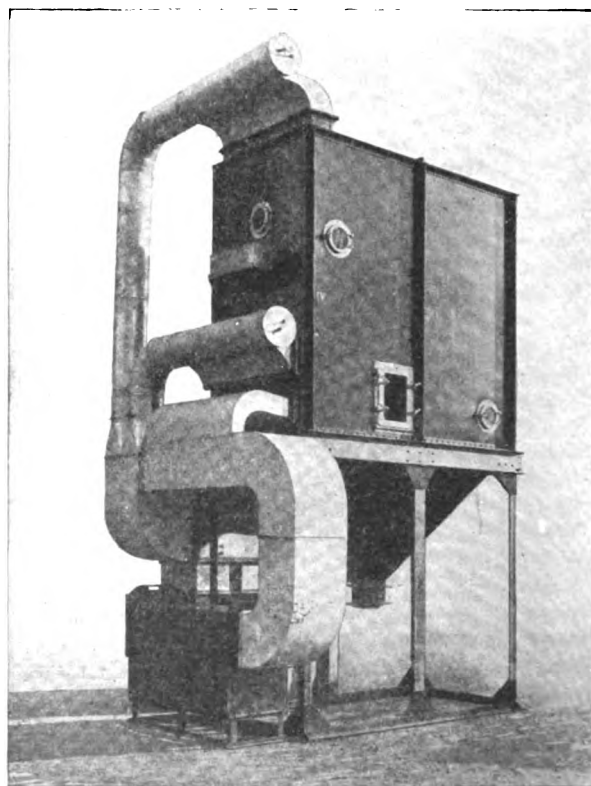
Dryers for Liquids

The spray dryers of this company are of the continuous operating type, delivering the product in powder or granulated form. They are inherently simple, fire-proof, economical to operate, require no skilled attendance and do not affect the most delicate products.

The spray dryers not only offer their inherent advantages, but their use usually eliminates from the manufacturing process many troublesome and expensive steps, such as filtering, cake drying, grinding and screening.

Dryer House—Built of special insulated steel panels mounted on steel framework. Inner surface of house can be tiled or painted to suit product to be dried. Hopper and conveyors furnished with each installation.

SWEET'S CATALOGUE



TYPICAL DRYER UNIT

MIDWEST STEEL & SUPPLY CO.

INCORPORATED

Air Filters, Timber Joint Plates, Steel Sections

EXECUTIVE OFFICES

28 West 44th Street

NEW YORK, N. Y.

BRANCHES IN ALL CITIES

CABLE
"MIDWESTEEL"
All Codes Used

Products

MIDWEST UNIT AIR FILTERS, for central power stations, heating and ventilating, air compressors, and wherever dust or dirt is a destructive factor; MIDWEST "BULLDOG" TIMBER JOINT PLATES, for joining timber construction; MIDWEST STEEL SECTIONS, a flexible system for the anchoring and support of shafting lay-outs, etc.

Midwest Unit Air Filter

Ordinary atmospheric air contains a considerable quantity of impurities such as sand, fine dust, soot, etc. Such impurities are especially destructive to turbo-generators, compressors, gas engines and similar machinery. Elimination of these impurities brings increased efficiency to the machinery and prolongs its life. The Midwest unit air filter removes the impurities *without* the use of water sprays. Air, cleaned by washing, is highly humidified and consequently very injurious to machinery.



FIG. 1. MIDWEST UNIT AIR FILTER

Construction and Operation of Midwest Filter—

The filter consists of a number of units, or cells, each 20x20x4 in. in size. Each unit consists of a frame and cell proper. The cell proper has an expanded metal face and perforated plate back, and is filled with filter bodies. These filter bodies are small, special metal cylinders, each with a comparatively large surface, and are kept moist with a liquid called "Viscosine." The air or gas to be cleaned is drawn, or in some cases forced, *in ever-changing directions* through the filter bodies. All particles of dust are brought into intimate contact with the Viscosine and the air is thoroughly cleaned through precipitation and adhesion of the dust. The cell can be readily removed from its frame for cleaning and recharging purposes.

The units are bolted together and form filter systems of any desired size or shape.

Each unit or cell under normal "dust" conditions requires cleaning and recharging every six to twelve weeks.

Midwest "Bulldog" Timber Joint Plates

"Bulldog" is a cold rolled steel plate for joining timbers, provided with numerous sharp, strong teeth on both sides. When the joint is drawn up tight with the

bolt going through the square hole of the plate, it provides great rigidity and strength. As the nut is tightened *the teeth cut into the wood* evenly and easily on both sides and an absolutely firm connection is made.



FIG. 2. "BULLDOG" TIMBER JOINT PLATE

Midwest Steel Sections

Midwest steel sections are designed for supporting shaft hangers, overhead trolley runways, heavy or light piping, cables, etc.

The Box Rail (Concrete Structures)—A hollow steel section (Fig. 3) with bottom flanges turned up so as to form vertical ribs. When embedded in the concrete, the bottom flanges are flush with bottom of concrete member. Bolts for fastening shaft hangers, etc., are inserted into "box" rail at any desired point, turned through 90°, then pulled down till grooves in bolt head fit over vertical ribs of "box" rail. Dependable anchorage is provided.

The Ankerette—A lighter form of the "box" rail for fastening sprinkler, lighting and hot water systems, etc.

Midwest Steel Stringer (Fig. 4)—Used for supporting shaft hangers where these can not be directly attached to beams or girders of factory ceiling. Stringers are fastened to I-beam flange or concrete or wooden beams by means of Midwest bolts and clips. This method eliminates drilling of field holes. Stringers can be easily and quickly adjusted.

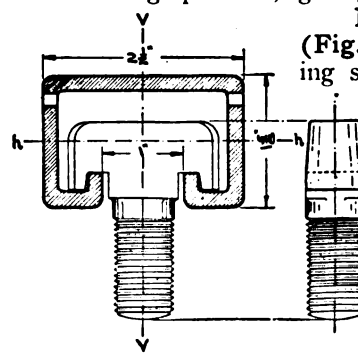


FIG. 3. MIDWEST "BOX" RAIL

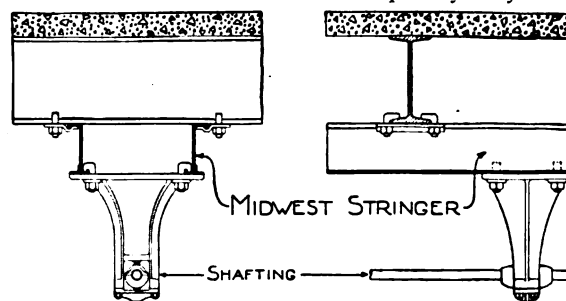


FIG. 4. METHOD OF USING MIDWEST SYSTEM (STEEL STRINGER METHOD)

PARKS-CRAMER COMPANY

Manufacturers of Humidifying Apparatus
FITCHBURG, MASS.

BRANCH OFFICES

BOSTON, MASS., 1102 Old South Building

CHARLOTTE, N. C.

Products

AIR CONDITIONING SYSTEMS.

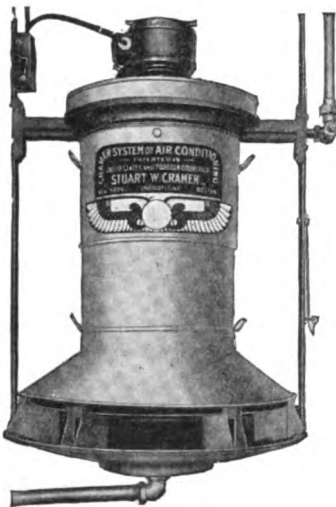
For the Merrill Process of Industrial Heating, see page 877.

Air Conditioning Systems

No single air conditioning system will apply to all conditions or requirements of humidifying. There is a right kind for every particular problem. Those described below constitute the complete Parks-Cramer line.

Fan Driven (High Duty) Humidifiers

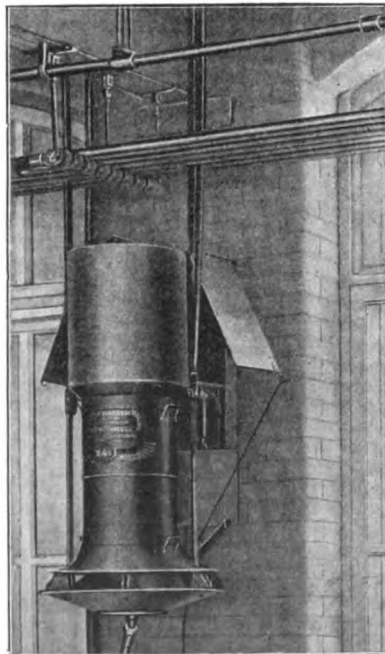
For use with electrically and water motor driven fans and made in two types: local ventilating and wall ventilating.



"HIGH DUTY" COPPER FAN AIR CONDITIONER

High Duty Fan Air Conditioner—The only really successful fan humidifier. It does not blow out drops of water and has an instantly accessible interior.

Ventilating Fan Air Conditioner—This head will deliver 60,000 cu. ft. of fresh washed and humidified air per hour—reduced in warm weather to the wet bulb temperature, and in winter warm tempered air if hot water is used.



VENTILATING FAN AIR CONDITIONER

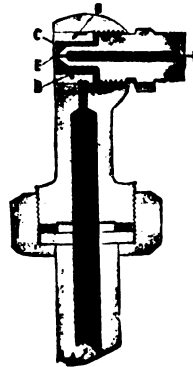
Atomizer Type Humidifier

For general mill use, best adapted to old or low posted rooms. Special applications such as direct applications of moisture on picker laps, a further refinement being the turbo-sprayer. Compressed air cleaning as a by-product.

Turbo-sprayer—Its fundamental principle is a combination of the old ejector idea and the turbine. Air is applied tangentially and centrifugally, producing complete vaporization of the water.

Humidity Regulating and Indicating Apparatus

The diaphragm humidity and temperature regulator illustrated, maintains automatically predetermined conditions of humidity and temperature. The range of adjustment can, within wide limits, be anything the user desires.



CROSS SECTION OF TURBO HEAD

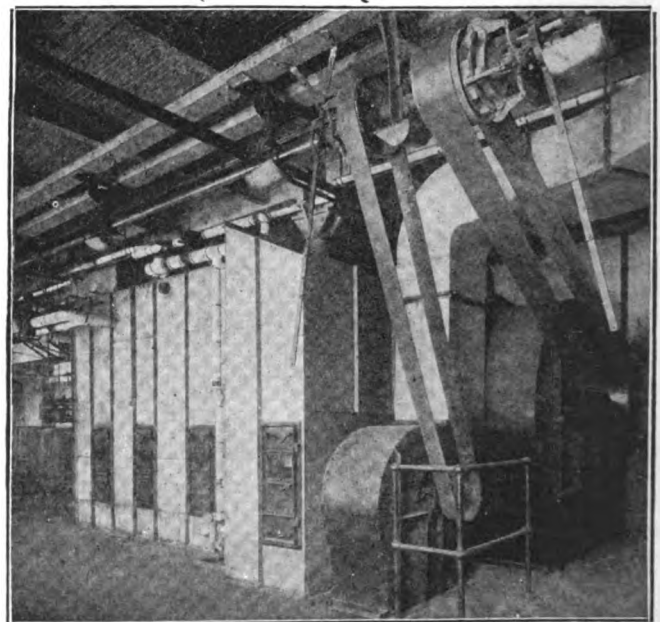


DIAPHRAGM HUMIDITY AND TEMPERATURE REGULATOR

Central Station Equipment

Complete central station equipment includes ventilating, cooling, heating, humidifying, constant regain and air cleaning apparatus.

Having the conditions of temperature and humidity it is desired to secure, and the limits between which they must be maintained, the properly designed central station system with regulation can be installed to give those conditions regularly, positively and with a minimum of attention.



CENTRAL STATION EQUIPPED WITH DOUBLE FAN

ESTABLISHED 1863

GREENE, TWEED & CO.

Manufacturers of Automatic Force Feed Lubricators

TELEPHONE CONNECTION

109 Duane Street
NEW YORK, N. Y.**Product**

ROCHESTER AUTOMATIC LUBRICATORS.

Application

For the lubrication of the cylinders of all types of steam engines and pumps as well as air and ammonia compressors.

Construction

Working parts are made of steel, and all bearings case hardened.

The mechanism of the Rochester automatic lubricator is compactly centered in a steel pump block, the principal working parts being enclosed and protected from dirt, grit, etc.

This block with all the mechanism can be almost instantly detached and removed, giving easy access to all the working parts for cleaning, repairing, etc., without disturbing the bowl or reservoir attached to the engine.

Driving Mechanism

The clutch drive, while positively noiseless, is absolutely positive.

Notwithstanding the fact that the drive is a clutch drive, there is a regulating device whereby can be induced more or less lost motion of the actuating arm.

The clutch drive Rochester is especially adapted for use on high speed engines, having been used with great success on an engine running at 800 r.p.m.

Ratchet drive lubricators can be furnished if desired, at an advance of \$2.00 over the list prices for the clutch drive model.

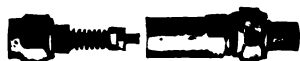
Regulation

Each feed regulated independently. Not affected by temperature, pressure or vacuum.

Improved Vacuum and Check Valve

One of these check valves is furnished with each feed of every Rochester lubricator.

Special steel check valves and nipples, for use on ammonia cylinders, will be substituted if so specified on the order.



IMPROVED VACUUM AND CHECK VALVE

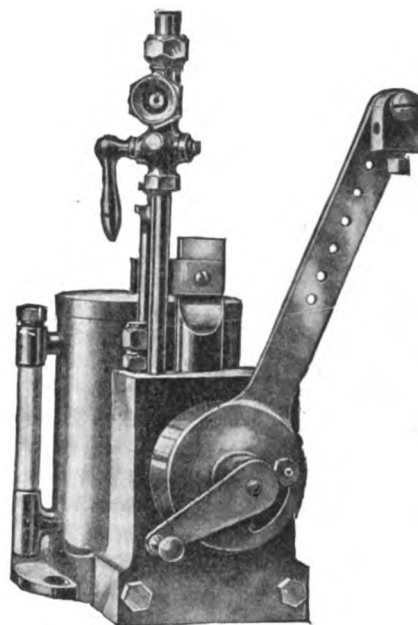
Sizes

Made in all sizes from 1 pt. to 2 gal., and with any number of feeds from 1 to 8.

All sizes fully nickelplated.

Also made with 2 compartments, for use where different kinds of oil are used in the different cylinders

of the same machine, as in the case of air compressors, ice machines, etc.



2-PINT SIZE SINGLE FEED LUBRICATOR—CLUTCH DRIVE MODEL

LIST PRICES, FOR CLUTCH DRIVE MODEL
FOR STATIONARY AND MARINE ENGINES AND PUMPS

1-pint single feed.....	\$25.00
2-pint single feed.....	30.00
3-pint single feed.....	35.00
1/2-gallon single feed.....	40.00
1-gallon single feed.....	45.00
2-pint double feed.....	45.00
3-pint double feed.....	50.00
1/2-gallon double feed.....	55.00
1-gallon double feed.....	60.00
2-gallon double feed.....	75.00
1/2-gallon triple feed.....	70.00
1-gallon triple feed.....	80.00
2-gallon triple feed.....	90.00
1/2-gallon quadruple feed.....	90.00
1-gallon quadruple feed.....	100.00
2-gallon quadruple feed.....	105.00
2-gallon quintuple feed.....	120.00
2-gallon sextuple feed.....	130.00
2-gallon septuple feed.....	140.00
2-gallon octuple feed.....	150.00

Advance these list prices \$2.00 for the ratchet drive model.

FOR AIR COMPRESSORS AND ICE MACHINES

3-pint double feed, 2-compartment.....	55.00
1-gallon double feed, 2-compartment.....	65.00
1-gallon triple feed, 2-compartment.....	85.00
1-gallon quadruple feed, 2-compartment.....	105.00

Advance these list prices \$2.00 for the ratchet drive model.

Prices include a multiplus sight feed, a vacuum and check valve and a steam nipple with each feed of every lubricator; also a connecting rod and connection for connecting the lubricator to the engine, pump or compressor.

Some Prominent Users

American Steel & Wire Co.
Atlas Portland Cement Co.
Carnegie Steel Co.
E. I. du Pont de Nemours & Co.
International Silver Co.
National Cash Register Co.

National Tube Co.
Pennsylvania Railroad Co.
Procter & Gamble Co.
John A. Roebling's Sons Co.
Tennessee Coal, Iron & Railroad Co.
Tiffany & Co.

SHERWOOD MANUFACTURING COMPANY

Brass Founders and Finishers; Engineering Specialties

1702-1716 Elmwood Avenue

BUFFALO, N. Y.

BRANCH OFFICES

NEW YORK, 220 Broadway
CHICAGO, 1514 Kimball Building

BOSTON, 27 School Street
ST. LOUIS, 3706 Ohio Avenue
LONDON, GREEN & BOULDING, LTD., E. S., 162a, Dalston Lane

PHILADELPHIA, 136 Chestnut Street
SAN FRANCISCO, 709 Mission Street

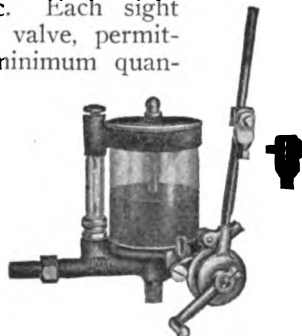
Products

"SHERWOOD" DOUBLE TUBE AUTOMATIC INJECTORS; "EAGLE" EJECTORS; "HART" FORCE SIGHT FEED OIL PUMPS; "FELTHOUSEN" HAND CYLINDER OIL PUMPS.

Also manufacturers of "Buffalo" Automatic Injectors; "Sherwood" Acid Ejectors; "Buffalo" Boiler Oil Injectors; "Buffalo" Cylinder Lubricators; Automatic Crank Pin and "Buffalo" Oil Cups; Multiple Oilers; Oil Gauges; Lubricating Devices; "Niagara" and "Sherwood" Plain Brass Grease Cups; "Buffalo" and Screw Feed Compression Grease Cups; "Engineer's Favorite" Flue Cleaners; "Duplex" Flue Scrapers; "Favorite" Steam Flue Blowers; "Dean" Automatic Rotary Flue Scraper; Three-Way Indicator Cock; "Felthousen" Improved Ball Gauge Cock; "Safety" Hose Connections; Fusible Plugs; Oxygen and CO₂ Cylinder Valves; Bearings and Bushings, alloy, brass or bronze; Brass and Bronze Castings to specifications; Metal Specialties to order.

"Hart" Force Sight Feed Oil Pump

For force feed lubrication of steam engines, steam pumps, air compressors, etc. Each sight feed has independent needle valve, permitting accurate regulation of minimum quantity of oil delivered to each feed; eliminates waste. Plungers have constant length stroke regardless of amount of oil pumped. Large, easy reading sight feed glass, always at atmospheric pressure. All "Hart" pumps tested against steam pressure before shipment.



"HART" FORCE SIGHT FEED OIL PUMP

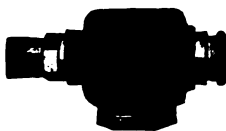
"HART" FORCE SIGHT FEED OIL PUMPS

Capacity	Size of glass, in.		Price			Capacity	Size of glass, in.		Price			
	Diam.	Height	One-feed	Two-feed	Three-feed		Diam.	Height	One-feed	Two-feed	Three-feed	Four-feed
1/2 pt.	3	3	\$16.00			2 qts.	5	6	\$35.00	\$45.00	\$60.00	\$80.00
1 pt.	3 1/2	4	20.00	\$30.00		3 qts.	5	8	40.00	50.00	70.00	90.00
1 qt.	4	5	25.00	35.00	\$45.00	1 gal.	6	8	45.00	55.00	80.00	100.00
3 pts.	4 1/2	6	30.00	40.00	55.00							

Right-hand pumps are always shipped, unless left-hand are particularly specified.

"Eagle" Ejector

Designed for raising water from deep wells and pumping out holds of vessels, the "Eagle" Ejector handles up to 15,000 gals. per hour and is operated by a comparatively small amount of steam.

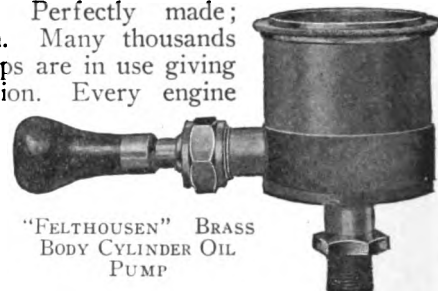


"EAGLE" EJECTOR

It has no moving parts; is constructed of brass and bronze castings and is not subject to corrosion.

"Felthousen" Hand Cylinder Oil Pumps

For lubricating engine and steam pump cylinders, etc.; simple in construction; any one can readily understand their use. There are two check valves between oil and steam. Perfectly made; elegant in finish. Many thousands of these oil pumps are in use giving perfect satisfaction. Every engine should have one of these pumps whether provided with automatic lubricator or not.



"FELTHOUSEN" BRASS BODY CYLINDER OIL PUMP

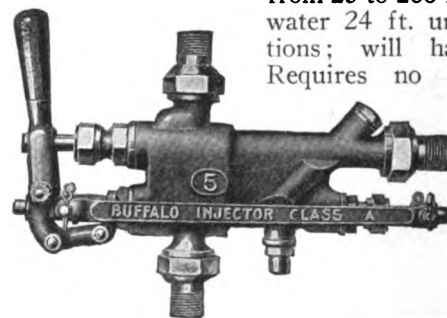
"FELTHOUSEN" HAND CYLINDER OIL PUMPS
Screw top or strainer top

Size	Brass body					Glass body				
	Side outlet	3	04	4	8	5	3	04	4	5
	Bottom outlet	03	6	7	9		03	6	7	
Capacity, pts.		1/2	3/4	1	1 1/2	2	1/2	3/4	1	1 1/2
Pipe thread, in.		3/8	1/2	3/4	1	1 1/2	3/8	1/2	3/4	1
Price, polished brass		\$6.00	7.00	9.00	11.00	25.00	6.00	7.00	9.00	25.00
Price, nicked		\$6.50	7.50	9.75	11.75	26.00	6.50	7.50	9.75	26.00

"Sherwood" Double Tube Injector, Class "A"

A double tube or compound injector, comprising two sets of jets. One set acts as ejector; lifts water, supplying it to second set, which does the forcing.

Operated by one lever; works on any pressure from 25 to 200 lbs. or more. Lifts water 24 ft. under proper conditions; will handle hot water. Requires no valve in either



"SHERWOOD" DOUBLE TUBE INJECTOR

"SHERWOOD" DOUBLE TUBE INJECTORS, CLASS "A"

Size	Size connections, in.		Capacity, gals. per hr.	Horsepower	Price
	Suction and delivery	Steam			
5	1/2	1/2	130	8 to 12	\$25.00
5 1/2	1/2	1/2	180	12 to 25	25.00
7	3/4	3/4	250	20 to 35	35.00
9	3/4	3/4	350	30 to 45	40.00
9 1/2	1	1	450	40 to 60	60.00
11	1	1	575	60 to 80	65.00
13	1 1/4	1 1/4	725	75 to 100	80.00
13 1/2	1 1/4	1 1/4	900	90 to 125	85.00
15	1 1/2	1 1/2	1260	120 to 175	85.00
15 1/2	1 1/2	1 1/2	1700	150 to 235	100.00
17	2	2	2200	200 to 300	130.00
19	2	2	2800	250 to 380	135.00
21	2 1/2	2 1/2	3500	350 to 500	150.00
23	3	2	5000	750 to 950	225.00

BOUSMAN MANUFACTURING CO.

Manufacturers of Oil Filters and Stills

GRAND RAPIDS, MICH.

Products

OIL FILTERS for filtering engine oils.

STILLS for the reclamation of gasoline and similar hydrocarbons.

Bousman Oil Filters

Will remove all water, grit, dirt and other impurities from lubricating oil. They can be used independently or in connection with lubrication systems and require very little attention.

Square Type Filter—This type is made up of an end chamber and water separator, followed by four filtering chambers and a clean oil storage compartment. The oil enters the end chamber, passes by gravity and capillary attraction through from 4 to 10 ft. of fine, dry filtering materials, and is stored in the clean oil storage compartment at the disposal of the operator. Each filter is furnished with a heating coil for use when filtering heavy oils. Its flat shape makes it especially suitable for installing in restricted spaces. Made in sizes with capacities of from 5 to 250 gals. per day.



BOUSMAN SQUARE TYPE OIL FILTER

Round Type Filter—Constructed on the same general scheme as the square filter, and its performance is equally satisfactory.

The IX Oil Filter—Designed primarily for installation into a lubrication system but may also be used as an independent unit. The equipment consists of a dirty oil tank, water separator, filter proper and clean oil tank. Dirty oil is pumped into the elevated receiving tank, from where it flows by gravity through the water separator and filter proper into the clean oil tank.



From here the oil passes to the bearings. By means of by-pass piping and valves, the filter may be cleaned, one compartment at a time without interrupting its operation. Capacity 300 gals. per day. Furnished with or without heating coil.

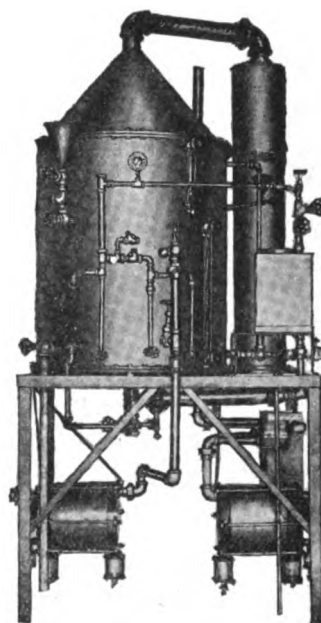
Continuous Filters—The F. S. and H. M. continuous filters are made exclusively for use in lubricating systems. Made in any size to suit the volume of oil to be filtered. When operated continually these filters may be used at least six months or longer before requiring cleaning, depending on the amount of dirt suspended in the oil.

Bousman Still

The Bousman still is a compact, efficient unit designed for restoring dirty gasoline and similar products to a usable condition, free from water, dirt and other impurities. The dirty gasoline is vaporized by means of steam in one compartment, then condensed in another compartment, and the condensate is passed through a separator which removes all water. The gasoline comes out entirely free from moisture or dirt.

This still is absolutely safe, consumes little steam, and requires very little attention.

Made in sizes with capacities of from 10 to 500 gals. per hour.



BOUSMAN STILL

Engineering Service

The services and experience of our lubricating engineers are at your disposal. We are fully prepared to give advice on lubricating problems and to design and install lubricating systems.

Bulletins giving detailed information on our filters and stills will be sent on request.

S. F. BOWSER & COMPANY, INC.

INCLUDING THE RICHARDSON-PHENIX DIVISION

Manufacturers of Complete Oil Storage, Lubricating and Filtering Systems
FORT WAYNE, IND.

S. F. BOWSER COMPANY, LTD., TORONTO, ONT.

S. F. BOWSER & CO. OF TEXAS, DALLAS, TEX.

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LONDON

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MEMPHIS, TENN., 606 Falls Building
MINNEAPOLIS, MINN., 642 Builders Exchange Building
NEW YORK, N. Y., 50 Church Street
PHILADELPHIA, PA., 201-203 Abbot Building
PORTLAND, ORE., 719-720 Corbett Building
PITTSBURGH, PA., 507 Oliver Building
SAN FRANCISCO, CAL., 612 Howard Street
ST. LOUIS, MO., 1407 Syndicate Trust Building
TORONTO, ONT., 66-68 Frazer Avenue
WASHINGTON, D. C., 207 Evans Building
DENVER, COLO., 520 Majestic Building

Products and Service

COMPLETE SYSTEMS for the STORAGE and CONTROL of OILS and GASOLINE.



Consolidation for Greater Service

In October, 1921, the Richardson-Phenix Company of Milwaukee became consolidated with S. F. Bowser & Company, Inc., of Fort Wayne.

By this consolidation the Bowser line becomes complete in every detail of equipment for scientific lubrication. A list of this equipment is shown below:

Oil Filters and Complete Oiling Systems for—

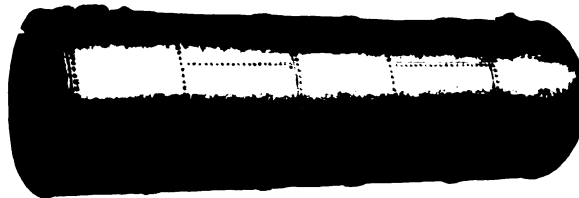
General Industrial Power Plants
Public Service Power Plants
Hydro-electric Power Plants
Refrigeration Plants
Marine Power Plants
Cutting Oil Systems
Quenching Oil Systems

Force-feed Lubrication for—

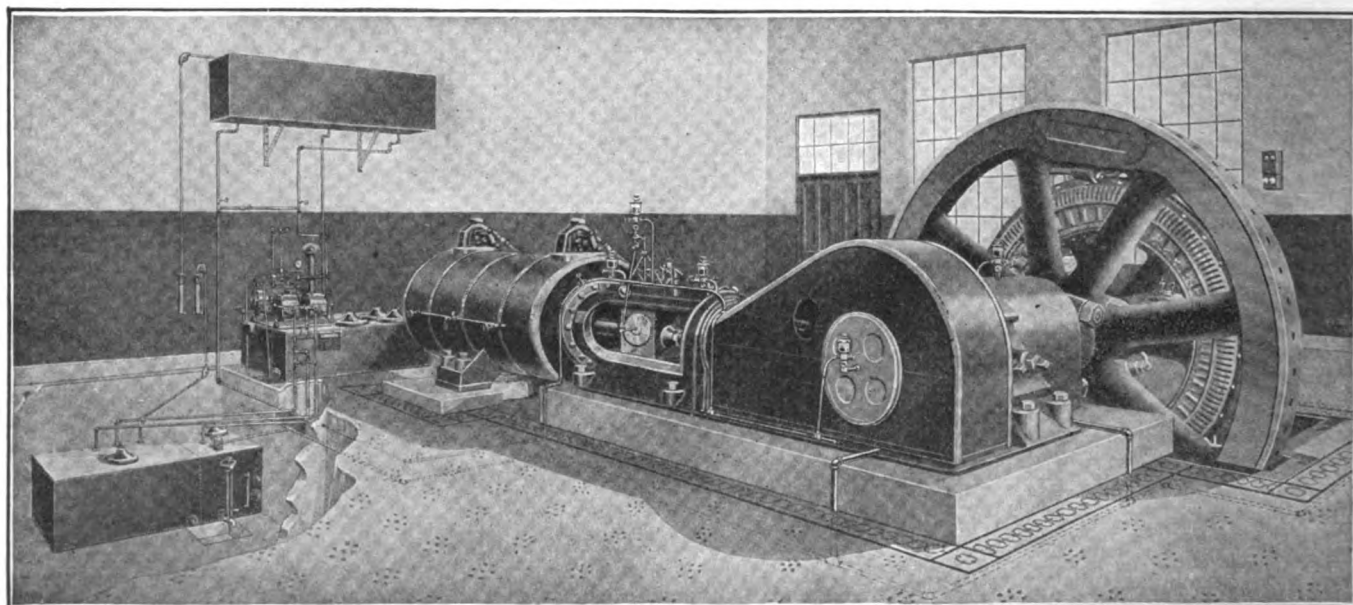
Sawmills
Steel Mills
Machine Tool Works
Paper Mills
Forge Shops
Power Plants of all Industries

Oil Reclaiming Apparatus for—

Diesel engine oil
Motor vehicle engine oil



LARGE TANK FOR BULK OIL STORAGE,
EITHER ABOVE GROUND OR UNDER GROUND



ENGINE IS LUBRICATED BY THE BOWSER FILTERING AND CIRCULATING SYSTEM—EVERY BEARING
IS SUPPLIED WITH CLEAN, COOL OIL IN STREAM FEED

Bowser Experience

The many years' experience of S. F. BOWSER & COMPANY, INC., in meeting the various requirements of industrial plants for storage and distribution of all kinds of oils qualifies them to handle this class of business in the best way.

Whether the requirements are for large or small storage tanks, whether the installation must be made underground or above ground, and whatever means of distribution are necessary, the Bowser line includes them.

A quality product which guarantees satisfactory service and because of its long life proves cheapest in the end. Put your oil handling problem up to Bowser.

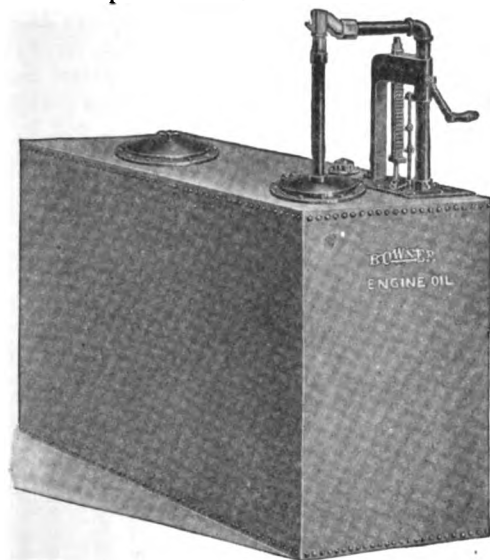


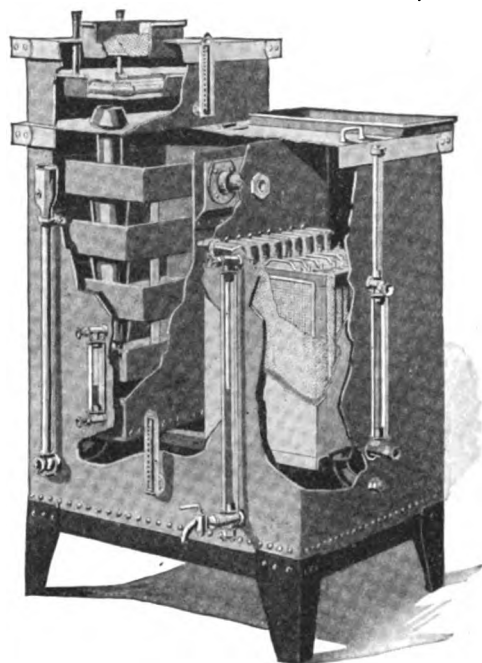
FIG 64. UNIT

Can be arranged in battery form, one unit for each oil

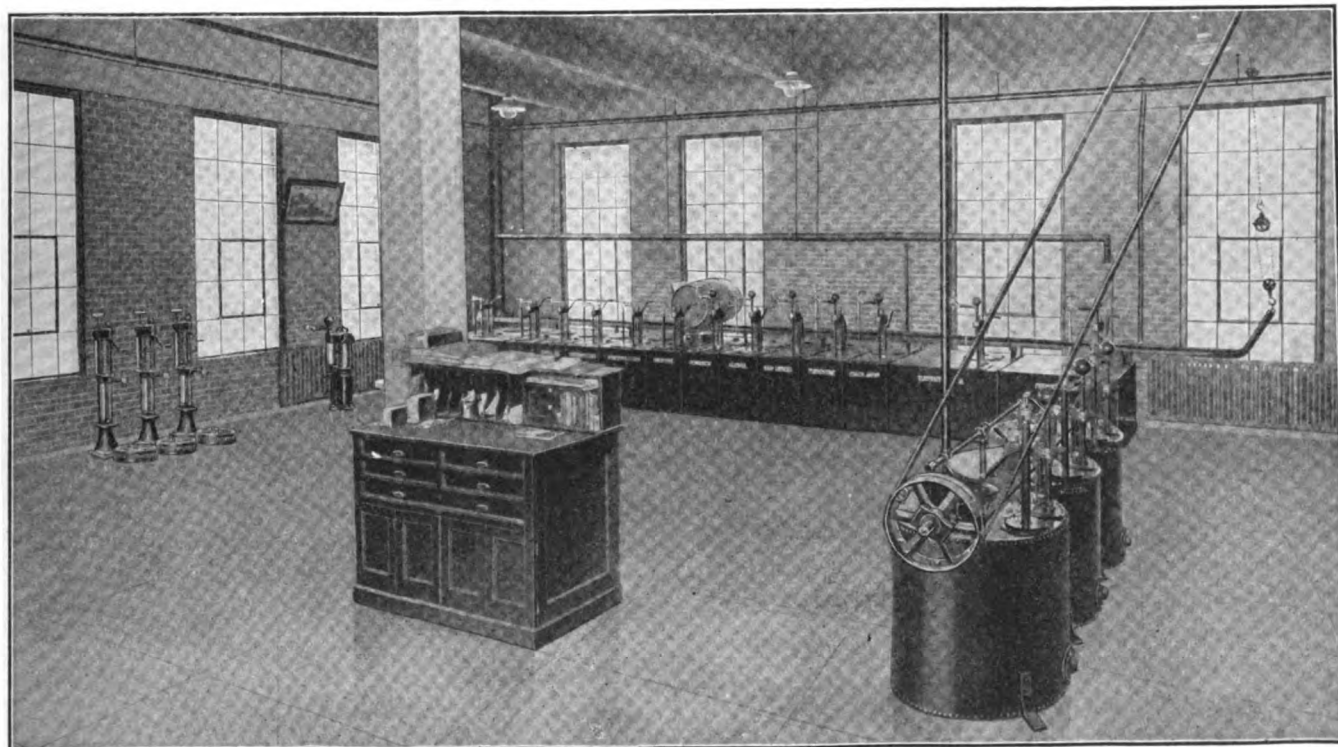
Bulletins

Complete details giving the construction, operation and dimensions of each of our outfits are given in our bulletins.

These bulletins are gladly furnished on request either from our Home Office at Fort Wayne or our District Offices.



R. P. No. 5 TYPE "AS" FILTER



REPRESENTATIVE OIL HOUSE

Showing paint oil and lubricating oil equipment, agitator tanks and self-measuring pumps connected to large storage tanks in basement and underground

GILBERT AND BARKER MFG. CO.

Gasoline and Oil Storage Systems and Oil Burning Equipment
SPRINGFIELD, MASS.

Products

OIL STORAGE and HANDLING EQUIPMENT for factories, railroads, etc.

INDUSTRIAL GAS and OIL BURNING FURNACES and COMPLETE FUEL OIL BURNING SYSTEMS.

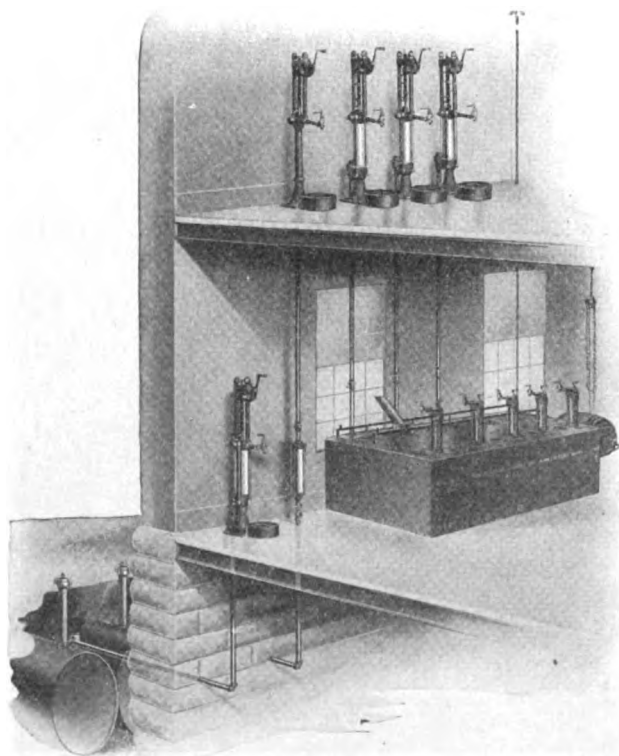
GASOLINE and OIL PUMPS and TANKS for filling stations and garages.

Service

The results of over half a century's experience in the handling and burning of gaseous and liquid fuels are built into every Gilbert and Barker product. The engineers of this organization are at your service at any time for consultation regarding the best and most economical methods of burning, handling and distributing oil for industrial purposes. Send for the literature noted below.

Oil Storage and Handling Equipment for Factories, Railroads, etc.

Gilbert and Barker systems meet every requirement for the efficient storage and distribution of oil, gasoline and other volatile liquids, in industry. Accurate self-measuring pumps and leakproof steel tanks assure economy in time and labor, absolute cleanliness and maximum safety. Write for Bulletin No. 63 O.S.



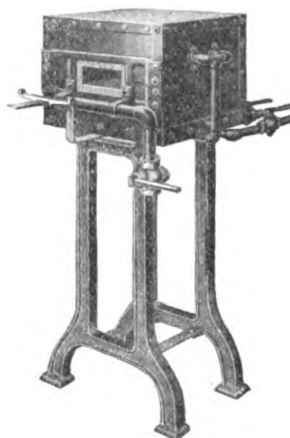
INSTALLATION OF OIL STORAGE AND DISTRIBUTING EQUIPMENT

Underground storage tanks, with measuring pumps on first and second floors; battery of first floor tanks, and pumps on floor above

Industrial Gas and Oil Burning Furnaces

Progressive manufacturers are turning more and more to the use of oil burning furnaces for metallurgical operations. The reasons are apparent: Oil is burned with a clean, clear fire with complete combustion and the fire is under absolute control at all times. There is no cooling at the stoking period—no losses in ash.

The GILBERT AND BARKER MFG. Co., as pioneers in the building of oil burning equipment, have designed and equipped many of the best forging and hardening rooms in the country and applied fuel oil to every process where it can be used economically. We will be glad to have you make use of our experience and equipment. Write for Bulletin No. 63F.



GAS AND OIL BURNING SEMI-MUFFLE FURNACE FOR HARDENING AND ANNEALING



GAS AND OIL BURNING FORGING FURNACE

Gasoline and Oil Pumps and Tanks for Filling Stations and Garages

Every need of the modern filling station or garage is met by Gilbert and Barker equipment. Self-measuring pumps that are fast and accurate in delivery and absolutely safe in operation; underground tanks welded and hot galvanized, provide the best possible storage for gasoline. In every case this equipment conforms to the high standards of safety prescribed by the Underwriters' Laboratories, Inc., and carries their label of inspection.

Write for Bulletin No. 63 G.



A GILBERT AND BARKER EQUIPPED FILLING STATION

WAYNE TANK AND PUMP CO.

726 Canal Street
FORT WAYNE, IND.

BRANCH OFFICES

ATLANTA, GA., 1221 Candler Bldg.
BALTIMORE, MD., 102 North Ave.
BIRMINGHAM, ALA., 5520 Fifth Ave., S.
BOSTON, MASS., Publicity Bldg.
BUFFALO, N. Y., 72 N. Park Ave.
CHICAGO, ILL., 350 Old Colony Bldg.
COVINGTON, KY., 4th and Bakewell Sts.
CLEVELAND, OHIO, 1833 E. 13th St.
COLUMBUS, OHIO, 141 E. Broad St.
DALLAS, TEX., 1911 Commerce St.
DENVER, COLO., 1104 Broadway
DETROIT, MICH., 23 Parsons St.

GRAND RAPIDS, MICH., 107 Kortlander Bldg.
INDIANAPOLIS, IND., Wimmer Bldg.
KANSAS CITY, MO., 1333 McGee St.
LOS ANGELES, CAL., 830 S. Los Angeles St.
MEMPHIS, TENN., 245 Monroe St.
MINNEAPOLIS, MINN., 1311 Hennepin Ave.
NEW ORLEANS, LA., 635 Baronne St.
NEW YORK, N. Y., 1780 Broadway
OMAHA, NEBR., 20 Helen Apts.
OKLAHOMA CITY, OKLA., 412 N. Broadway
PHILADELPHIA, PA., 112 N. Broad St.
PITTSBURGH, PA., 304 Union Arcade
RICHMOND, VA., 524 W. Broad St.

ROCHESTER, N. Y., 279 Rosewood Terrace
SPOKANE, WASH., 620 W. 2nd Ave.
ST. LOUIS, MO., 4873 Page Blvd.
SAN FRANCISCO, CAL., 631-33 Howard St.
TOLEDO, OHIO, 618 Platt St.
WASHINGTON, D. C., 732 Woodward Bldg.
TORONTO, CANADA, CANADIAN TANK AND
PUMP Co., 119 Adelaide Street, West
VANCOUVER, B. C., CANADIAN TANK AND
PUMP Co., 122 Cordova Street
ST. JOHN, N. B., CANADIAN TANK AND PUMP
Co.

Products

Complete GASOLINE and OIL STORAGE SYSTEMS; heavy METAL STORAGE TANKS; OIL FILTRATION SYSTEMS; OIL BURNING SYSTEMS; FURNACES for METAL MELTING, FORGING and HEAT TREATING.

Also Air Compressors.

For Water Softeners, see page 253.

Organization and Services

A national organization with offices in thirty-four American cities. Repair stocks and expert service at your command. Representatives everywhere.

"Wayne" Oil Storage and Distribution Systems

The building of an oil house and the installation of the necessary equipment constitutes one of the greatest economies an industrial plant can make, through the elimination of waste, and the accurate measurement and distribution of specific quantities of oil.

Shown herewith are several typical layouts of our systems selected from actual installations which we consider will meet the average requirement. Enlarged blue prints of these installations will be gladly furnished without obligation to prospective customers. Separate bulletins covering our different items of equipment can also be supplied.

Recommended Design of Oil House for Large Industrial Plant

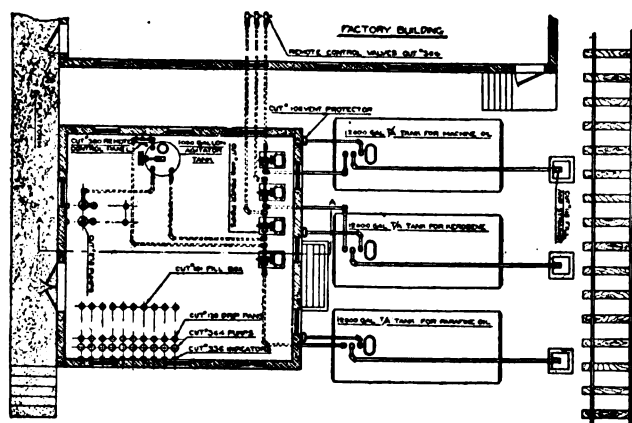
This design has a wide application to industrial plants, especially factories manufacturing machinery and small metal parts.

Equipment Required—Tanks—Underground car-load storage is provided for machine oil, kerosene, and paraffin oil. In the basement is a battery of ten 2-bbl. tanks for miscellaneous oils. This battery is equipped with barrel track for emptying barrels. In addition, there are two 1000-gal. tanks for lard oil and quenching oil, which may be filled either from the basement or from the fill boxes in the oil house floor. Countersunk in the floor is a 1000-gal. power driven agitator tank for compounding cutting oils. An outside stairway to the basement permits placing future tanks.

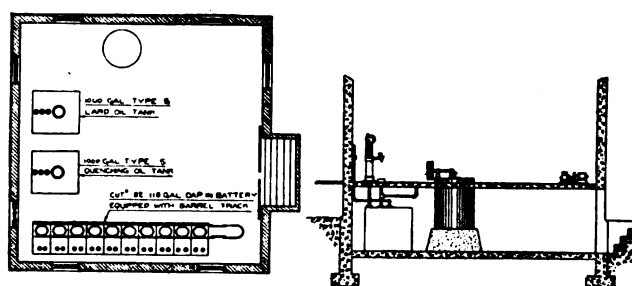
Pumps—There are ten 1-gal. stroke pumps located on the oil house floor and connected to the ten storage tanks. Two 5-gal. stroke pumps are connected to the two 1000-gal. tanks. One of these 5-gal. stroke pumps discharges into the agitator tank for measuring the lard oil content of the cutting oil. A pump is also connected to the outside paraffin tank and supplies a definite amount of this oil to the agitator tank, being controlled by a remote control panel. This panel consists of a



valve actuated oil switch, meter, strainer and air release. Three power pumps are provided to distribute the finished cutting oil, kerosene, and machine oil to the fac-

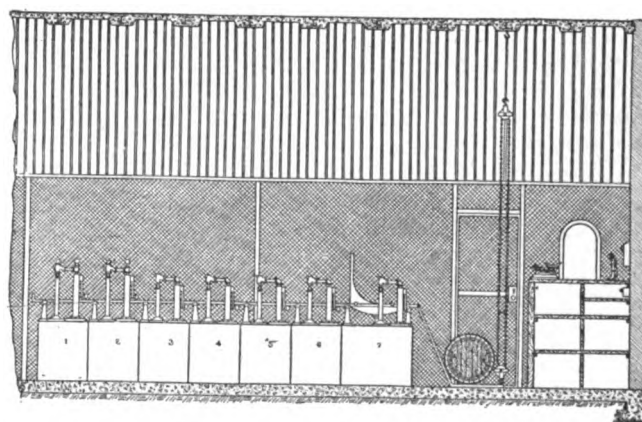


First Floor Plan



Basement Plan

FACTORY OIL STORAGE ROOM



tory. Remote control valves are located where these oils are used in the factory, and the power pumps may be operated and the oil drawn by simply opening one of these valves.

A Popular Method of Factory Oil Storage in Limited Space

It is often the case that a factory has no basement where tanks can be placed and no ground outside the building save a driveway.

Construction—An excavation is made in the driveway or alley, concrete floor and walls built, and after the storage tanks are placed the driveway is rebuilt, using reinforced concrete for the roof of the oil room. A manhole should be built in at the same time to allow easy access to tanks.

Equipment Required—Tanks—The tanks are placed in the pit and may be filled through the drip pans, or through fill boxes, embedded in the driveway, connected to the drip pan return lines. There are seven tanks which may be used for the following: Machine, quenching, cutting, motor, and soluble oil, kerosene and turpentine. The space required for the battery of tanks is 14 ft. 6 in. long by 3 ft. 4 in. wide by 2 ft. 6 in. high.

Pumps—The pumps and drip pans are placed inside the factory along the wall. Standard 1-gal. stroke pumps are used equipped with locks and keys so that the oils may be under supervision of one man and issued only on requisition. 100,000-gal. meters can be furnished on all pumps for a check on weekly or monthly consumption.

A Standard Design of Oil House for Railroads

Most railroads adopt a standard design of oil house, the size depending on the variety and amount of oil handled. Drawing 5212-D shows the design of such an oil house built to store and distribute six kinds of oil, and motor car gasoline.

Equipment Required—Tanks—The storage tanks, with the exception of gasoline, are placed in a basement with a pit constructed at one end for additional tanks, provided space has been left for them. In this basement are six 5000-gal. Type S tanks for the storage respectively of signal, valve, car, engine, and fuel oils, and kerosene, each tank being provided with two fill lines, one directly above the tank for emptying barrels and one under the platform at the siding for unloading tank cars. If the basement is not heated, the tanks containing the heavier oils should be equipped with steam coils to facilitate the pumping of the oils in cold weather. Wall indicators are connected to all tanks with the indicator board located in the storeroom above the tanks. A Type A tank is located underground at one end of the platform to store motor car gasoline.

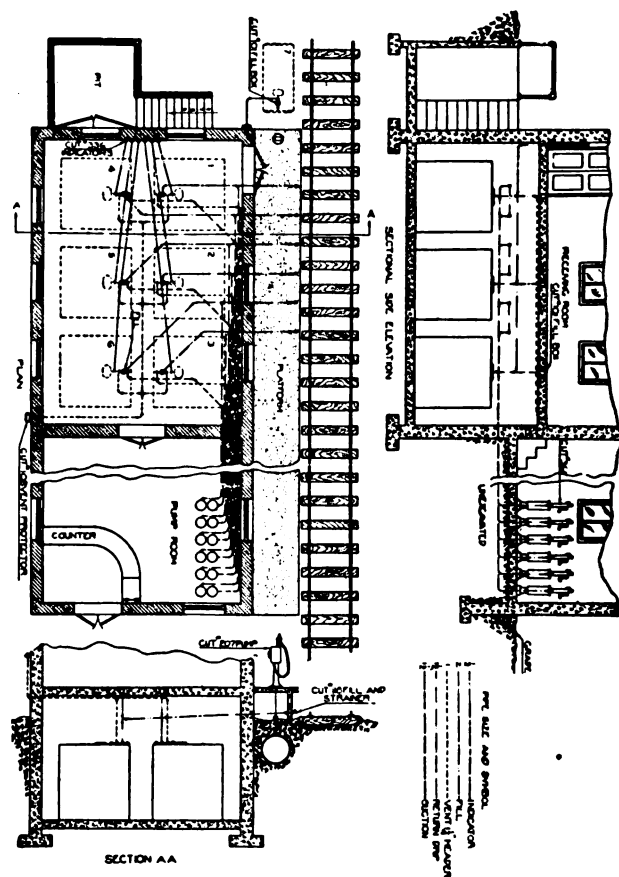
Pumps—A small pump room is partitioned off at one end of the building and is equipped with six 1-gal. stroke pumps. A 1-gal. stroke measuring pump is mounted on the platform with a suction line connected to the gasoline tank.

Pipes—The drawing shows the proper pipe layout for this installation. All suction lines should have at least a 1% fall in their lateral run from the pumps to the tanks and be free from air traps.

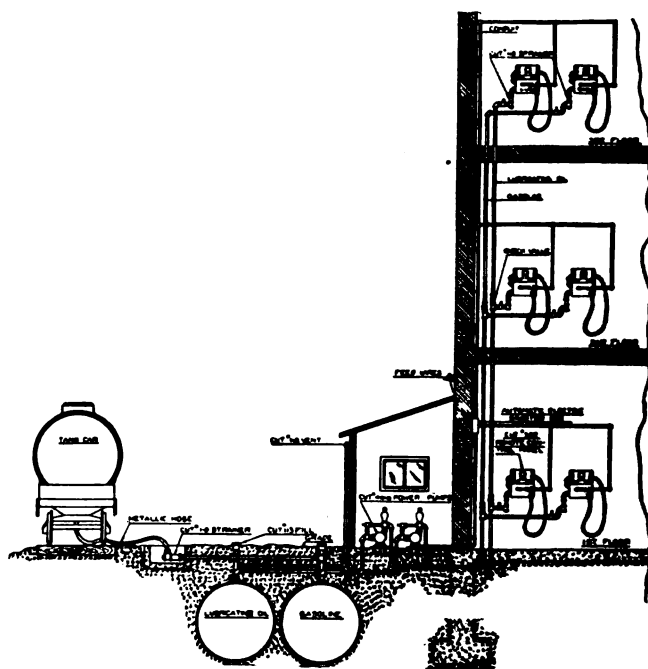
Power Distribution of Oil and Gasoline by Remote Control for Automobile Factories

The remote control system is illustrated on Drawing 5223-D.

In this design motor oil and gasoline may be purchased in tank cars which are unloaded by gravity into 10,000-gal. Type A underground storage tanks. Strain-



DRAWING 5212-D. RAILROAD OIL HOUSE



DRAWING 5223-D. REMOTE CONTROL SYSTEM FOR AUTOMOBILE FACTORY

ers are placed in the fill line to the tanks to prevent dirt getting into them from the tank cars.

Installation—The oil and gasoline are pumped from the underground tanks by means of two pumps directly connected to an electric motor which equipment is located in a small pump house. Remote control panels are located at the different points in the factory, such as the final assembly line, motor test blocks and dynamometer rooms. By means of these panels and the power

pumps, oil and gasoline are available in measured quantities when and where they are needed.

The remote control panel consists of a discharge valve which actuates an oil switch in the pilot line of an automatic starter in the electric motor feed line. When this valve is open, the circuit is closed and the pumps are started. When the valve is closed, the circuit is broken, stopping the pump. Each pump is provided with a by-pass, air chamber and relief valve to protect it from the shock of the closing of the discharge line. On top of the cabinet is located a flow meter which insures the drawing of accurately measured quantities of oil or gasoline. Each meter is protected by an air release valve

which will take any air out of the line before it reaches through the meter. Only a solid stream of liquid flows through the meter so that its measurement will be accurate.

The installation pays for itself in a short time through the saving of labor alone.

Oil Burning and Oil Filtration Systems

Special equipment is designed for the efficient burning and reclamation of oils. Layouts adaptable for all types of industry will be submitted without cost or any semblance of obligation.

Write for Bulletins 2500 and 5000.



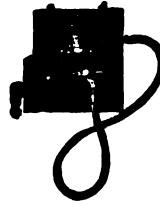
1-gal. Measuring Pump
For accurately measuring and recording oil consumption inside buildings



5-gal. Measuring Pump



Portable Steel Unit
With quart pump for distributing 65 gals. of lubricating oil



Remote Control System
Automatically operated, recording consumption



Oven Type Furnace
For hardening, tempering, annealing and case-hardening



Forge Furnace
For forging, welding, bull-dozing, dressing tools and heating drill steel



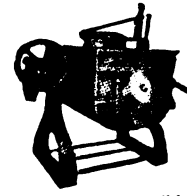
Portable Rubber Cement Outfit
With back geared quart pump. Keeps contents from air and prevents loss



Steel Storage Tank
Equipped with a belt driven agitator for the purpose of mixing oils of various kinds



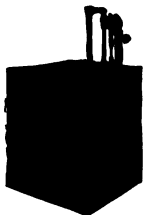
Crucible Tilting Type Melting Furnace
For brass, copper, etc., and other non-ferrous metals



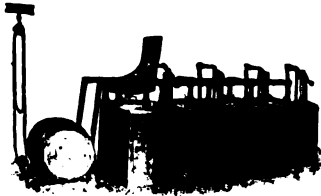
Tilting, Non-crucible Type Furnace
For brass, copper, etc., and other non-ferrous metals



Crucible Pit Type Furnace
For brass, copper, etc., and other non-ferrous metals



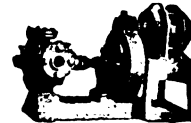
Popular Model for Handling Oil in Factories
Equipped with quart pump, 1- to 5-bbl. capacity



System for Handling One or More Grades of Oil
Barrel emptying device shown



Fuel Oil Pumping, Heating and Regulating System
Used with an oil burning system for power boilers



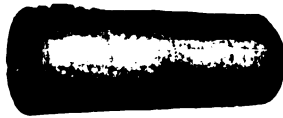
Impeller Type Power Pump
For pumping fuel, lubricating and paint oils, etc.



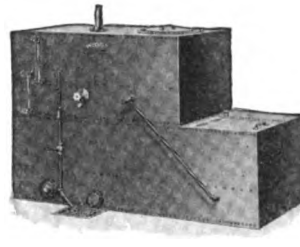
Type H Batch Filter
Small capacity filter for cleaning present high priced lubricating oils



Large Rectangular Steel Storage Tank
For above-ground storage purposes. Also made square



Heavy Metal Storage Tank
Ranges in capacity from 1000 to 25,000 gals.



Type B Turbine Filter
Large capacity batch filter for lubricating oils. Allows for precipitation and perfect filtration



Type BA Cutting Oil Filter
Large capacity batch filter. Screens, heats, precipitates and cleans cutting oils in batches

"WAYNE" PRODUCTS FOR STORING, MEASURING, DISTRIBUTING, BURNING AND FILTERING OILS

THE AMERICAN PULLEY COMPANY

MAIN OFFICE AND WORKS
4200 Wissahickon Avenue
PHILADELPHIA, PA.

BRANCH STORES CARRYING STOCK

NEW YORK, N. Y., 33-35 Greene Street
SEATTLE, WASH., 536 First Avenue S.
BOSTON, MASS., 165 Pearl Street

CHICAGO, ILL., 114-116 South Clinton Street
SAN FRANCISCO, CAL., 14 Natoma Street
LOS ANGELES, CAL., Sunset Terminal Warehouse

National distribution through Supply Houses from parent stocks in larger cities

Products

Manufacturers of AMERICAN STEEL SPLIT PULLEY; AMERICAN STEEL SPLIT PULLEY with CORK INSERTS.

Also manufacturers of American Pressed Metal Sash Pulleys; Reels, Spools, Beams, Stampings, and Pressed Metal Shapes.

Special Features of Belt Pulleys

- (1) Simplicity of design and construction.
- (2) Ease of installation on shafting.
- (3) No key seating or setscrews.
- (4) Well balanced and run true.
- (5) Stand greater strains than pulleys having much more weight.
- (6) Transmit maximum power with minimum belt slip.
- (7) Minimum air resistance effects enormous saving in power.
- (8) Recommended for rim speeds up to 6000 ft. per minute.



TRADE-MARK

(9) They are 40% to 60% lighter than cast iron pulley designed for equal service.

(10) Guaranteed for double belt duty under any conditions not demanding a special pulley.

Construction

Rim made from two or more channel sections. Mounted side by side forming in-turned rim flanges which stiffen rim at center where it is subjected to greatest strain from belt pull. This construction forms groove, running centrally around face of pulley (an exclusive feature) which prevents air cushioning by acting as an air escape. Rim has safety beaded edges.

Ends of arms milled to exact length and riveted to internal rim flange; *not* riveted through face of pulley. These flat "A" braced arms (edge on) cut, instead of fan, the air, thereby effecting power economy.

Furnished with crown or straight face.

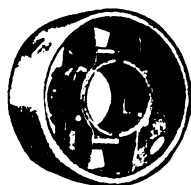
Information

Over 350 dealers carry American Steel Split Pulleys in stock.

Prices on application.



SIX-ARM PULLEY
7- to 42-in. diameter, inclusive



SMALL DIAMETER PULLEY
3-, 3½-, 4-, 5- and 6-in. diameter



EIGHT-ARM PULLEY
44- to 72-in. diameter, inclusive, with faces narrower than 16 in.



SPECIAL HEAVY DUTY PULLEY
For any especially severe service where nothing but a special will stand up



DOUBLE- AND TRIPLE-ARM PULLEY
12- to 120-in. diameter, inclusive, when width of face is too great for safety with single arms



PULLEY WITH CORK INSERTS

For use where an almost positive drive is required, insuring an absolute minimum of belt slip

THE BARTLETT HAYWARD CO.

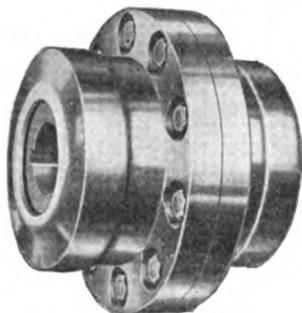
Manufacturers of the "Fast" Flexible Coupling
BALTIMORE, MD.

Product

"FAST" FLEXIBLE COUPLING.

Description

An all-metal, lubricated, flexible coupling, designed to meet the most exacting service conditions. It derives its flexibility from a simple mechanical principle. It has no pins, plates, rubber or leather bushings to fail



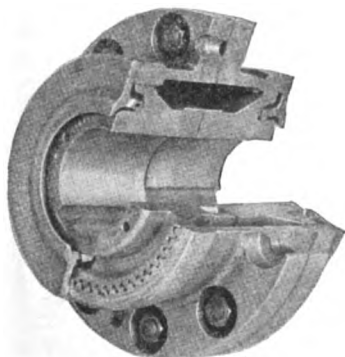
"FAST" FLEXIBLE COUPLING
Self-contained, lubricated, and dustproof

from fatigue or deterioration. Its life is not governed by the fatigue of materials. No element of the mechanism is subject to distortion with incident crystallization and ultimate failure.

It utilizes the new oil cushion internal spur gear principle. It is proved and perfected by exhaustive tests of service in fifty-eight different industries, over 500,000 h. p. in service.

The small number of parts entering into the construction of the "Fast" flexible coupling indicates the low maintenance cost which is characteristic of the device.

The lubricated, dustproof, self-contained design insures constant operating conditions and a life of the coupling equivalent to that of the connected machines. In capacity to transmit horsepower in any given size, at high or low speed, it has no equal.



SECTION OF THE "FAST" COUPLING

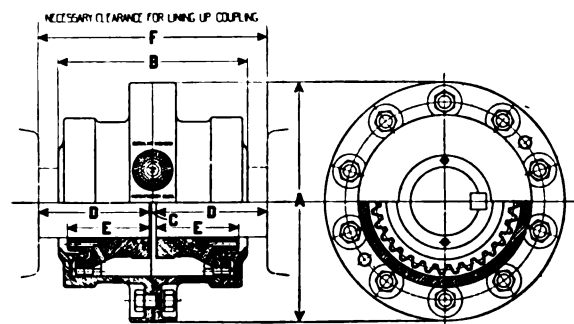
What the Coupling Does

- (1) Compensates for initial misalignment of shaft.
- (2) Compensates for wear of bearings.
- (3) Compensates for deflection of shafts.
- (4) Compensates for distortion due to temperature changes and other uncontrolled conditions.
- (5) Provides for incident lateral movements of shafts of the connected machines.

(6) Because lubricated and dustproof, will operate continuously where dust, dirt, dampness or heat are unavoidable.

COUPLING SERVICE UTILITY FACTORS FOR VARIOUS KINDS OF CONNECTED MACHINES

Kinds of Machines	Factor	Kinds of Machines	Factor
STEAM TURBINE DRIVEN		ELECTRIC MOTOR DRIVEN (Continued)	
Generator (even load).....	1.00	Crushers, ball or tube mills, veneer hogs.....	2.00
Generator (uneven load).....	1.50	Wood working machinery.....	1.50
Blower.....	1.00	Ammonia compressors.....	2.25
Centrifugal pump.....	1.25	Air compressors.....	2.50
Induced draft fans.....	1.50	Rolling mills, steel, rubber, brass.....	3.00
Line shaft through gears, ropes or belt.....	1.50	Mine hoists, elevators, cranes, etc.....	2.00
Triplex single acting pump through gears.....	1.75	Ship propeller.....	1.75
Duplex double acting pump through gears.....	1.50	Rotary pumps or blowers.....	2.00
Rolling mill through gears.....	2.50	Belt and chain conveyors.....	1.50
Ship propeller through gears.....	1.50		
ELECTRIC MOTOR DRIVEN		STEAM ENGINE DRIVEN	
Electric generator.....	1.50	Electric generator.....	1.75
Blower.....	1.25	Fans and blowers.....	2.00
Centrifugal pump.....	1.50	Centrifugal pump.....	2.25
Line shaft, direct or through reduced gears.....	1.75		
Triplex single acting pump.....	2.00	GAS OR OIL ENGINE DRIVEN	
Duplex double acting pump.....	1.75	Electric generator.....	2.00
Pulp grinders, screens, beaters, etc.....	1.75	Fans and blowers.....	2.25
		Centrifugal pump.....	2.50
		Single acting pump.....	3.00
		Double acting pump.....	2.75
		Ship propeller.....	2.50



DIMENSIONS AND RATINGS OF THE "FAST" COUPLINGS

Size No.	Max. Bore, in.	Forged Steel		Cast Iron		Dimensions, in.					
		Capacity h. p., per 100 r.p.m.	Maximum Speed, r.p.m.	Capacity h. p., per 100 r.p.m.	Maximum Speed, r.p.m.	A	B	C	D	E	F
1	1	2.8	14400			4 1/4	3 1/4	1 1/2	1 1/2	1 1/2	3 1/4
1 1/2	1 1/2	9.5	12000			6	4 3/4	1 1/2	2 1/2	1 1/2	5 1/4
2	2	22.4	9300			7	5 1/2	1 1/2	3 1/2	2 1/2	6 1/2
2 1/2	2 1/2	43.8	7000			8 3/4	6 1/2	1 1/2	4 1/2	3 1/2	8 1/2
3	3	75.5	6800			9 1/2	8 1/2	1 1/2	4 1/2	3 1/2	9 1/2
3 1/2	3 1/2	120	6000			11	9 3/4	1 1/2	5 1/2	4 1/2	11 1/2
4	4	180	5260			12 1/2	10 3/4	1 1/2	6 1/2	4 1/2	13 1/2
5	5	350	4300			15 1/2	13 1/2	1 1/2	8 1/2	6 1/2	16 1/2
6	6	605	3690	404	1000	17 1/2	16	1 1/2	9 1/2	7 1/2	19 1/2
7	7	960	3220	640	1000	20 1/2	18 1/2	1 1/2	11 1/2	8 1/2	22 1/2
8	8	1435	2845	957	1000	23 1/2	21 1/2	1 1/2	12 1/2	9 1/2	25 1/2
9	9	2010	2545	1362	950	25 1/2	24	1 1/2	14 1/2	10 1/2	28 1/2
10	10	2800	2310	1870	900	28 1/2	26 1/2	1 1/2	15 1/2	11 1/2	31
11	11	3730	2125	2490	825	31	29	1 1/2	16 1/2	13 1/2	34
12	12	4840	1975	3200	750	33 1/2	31 1/2	1 1/2	18	14 1/2	36 1/2

Engineering Service

For severe and special service conditions, write us fully, giving horsepower, speed and kind of machines to be connected, both driver and driven, as well as the largest shaft to be connected, so that our Engineering Department can advise the proper size and type of coupling to use.

Catalogues

Complete illustrated catalogue, giving full data and prices, sent on request.

THE A. & F. BROWN CO.

Engineers, Founders, Machinists and Millwrights

Power Transmission Specialists

79 Barclay Street

NEW YORK, N. Y.

WORKS: ELIZABETHPORT, N. J.

Products

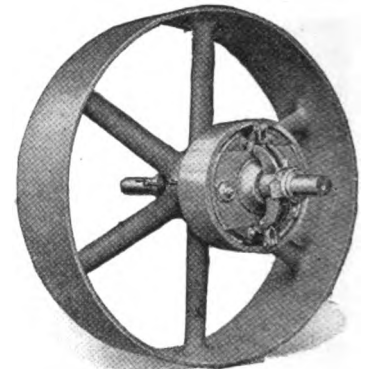
A complete line of POWER TRANSMISSION EQUIPMENT including Shaft Hangers, Friction Clutch Pulleys, Gears, Belt Tighteners, Rope Sheaves and Friction Clutch Couplings.

STEAM and AIR DRIVEN SIRENS; FOOT VALVES.
COLOR MIXERS and GRINDING MILLS.

The High Quality Line

Economy is where quality determines the price, not where price controls the quality. Poorly designed drives, cheap transmission machinery and improper erecting cause the worst leaks in a manufacturing plant. Preventing or stopping these leaks is our specialty. If you

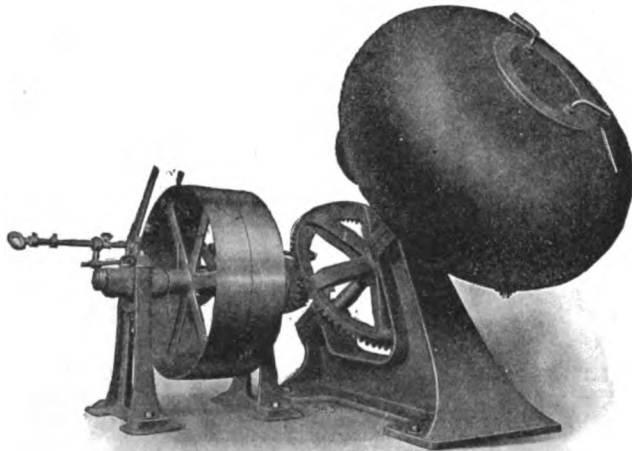
want the best, we shall be pleased to serve you, but if you are looking for the cheapest, you will buy the commercial material, the quality of which is controlled by competitive prices.



BROWN FRICTION CLUTCH PULLEY
(Our own patent)

Simple, compact, having few small parts. Engages gradually and when thrown in gear has a stronger grip than any other.

Contact between friction surfaces being nearly equal to circumference of clutch permits use of smaller size than in other designs, thus reducing weight on shafting



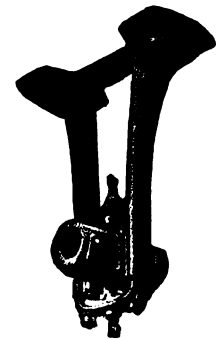
BALL COLOR MIXER

For mixing and secondary grinding of colors, etc. Made in 8 sizes, from 18 to 72 in.



SIREN

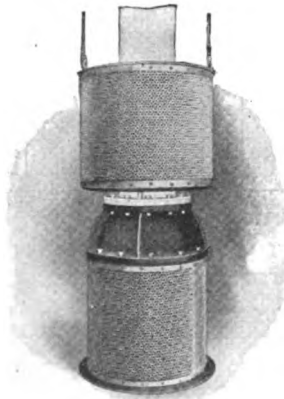
For signal and fire alarm siren as furnished the U. S. Navy
Also built for compressed air



ADJUSTABLE HANGER

With F. Brown's patent metallic wick self-oilers. Will not clog or glaze, and freedom of feed maintains a film of oil between shaft and bearing.

Many of these hangers have been in constant use 30 to 40 years without rebabbiting or signs of wear



NEWMAN PATENT CONTINUOUS SERVICE FOOT VALVE

No stoppage for cleaning. Outer screen is raised above surface to clean, and lowered again. Circular scraper cleans inner screen of any deposit accumulated when outer screen was raised



GEAR

Made of cast iron, semisteel, steel, bronze, rawhide, Bakelite, condensite and fiber
Machine moulded up to 16 ft. diameter

Cut spur up to 8 ft. diameter
Planed bevel up to 4 ft. diameter

THE CONWAY CLUTCH CO.

Manufacturers of Friction Clutches

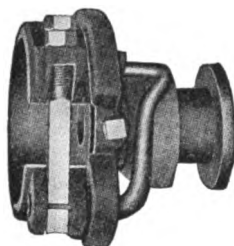
P. O. Station F
CINCINNATI, OHIO

Products

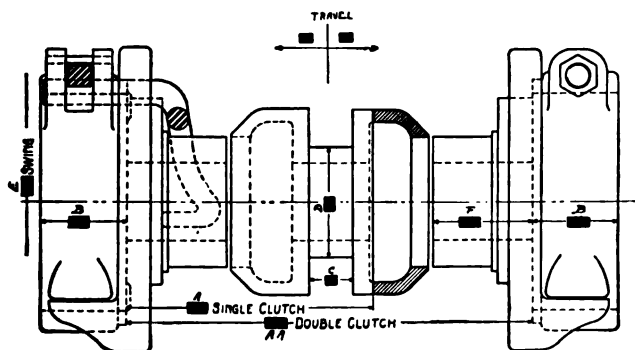
Manufacturers of FRICTION CLUTCHES since 1895: Compression, Expansion, High Speed, C. M. T., and Split Types.

Conway Compression Clutch

The Conway compression clutch has been called "the little clutch for the big job." Through a large lever ratio and a full floating friction band, a pressure per square inch is effected that makes it surpass in power any clutch of its attainments in measurement. Our clutches have an accessible, foolproof adjustment; have actuating parts made of Hyten B3 alloy stock, heat treated by our process and have all parts interchangeable and renewable. It is the only clutch for rough usage and general service.



CONWAY COMPRESSION CLUTCH



DIMENSION DIAGRAM, CONWAY COMPRESSION CLUTCH

Size of clutch	A	AA	B	C	D	E	F	Travel
3 1/4	4	7	1 1/2	3/4	2 3/8	6 1/2	1 1/2	1 1/4
4	4 3/8	7 7/8	1 3/4	7/8	2 1/2	7 1/2	1 3/8	1 1/2
5	5 1/8	8 1/2	1 7/8	1	3	9 1/2	2 1/8	1 3/4
6	5 3/4	9 1/2	2 1/8	1 1/8	3 1/2	11	2 3/8	1 7/8
7	6 1/4	10 1/2	2 3/8	1 1/2	3 3/4	12	3	2
8	6 3/4	11 1/2	2 1/2	1 3/4	3 1/2	14	3 1/2	2 1/4
10	7 1/2	12 1/2	2 3/4	2	3 3/4	16	3 3/4	2 1/2
12	8 1/4	14 1/2	2 1/2	1 3/4	4 1/2	18	4 1/4	2 3/4
15	10	15	3	1 3/4	4 1/2	21 1/2	5	3

All dimensions in inches.

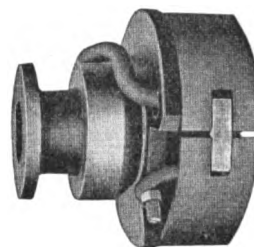


CONWAY CLUTCH EQUIPPED SOAP PRESS OF
THE HOUGHIN-AIKEN CO.,
BROOKLYN, N. Y.

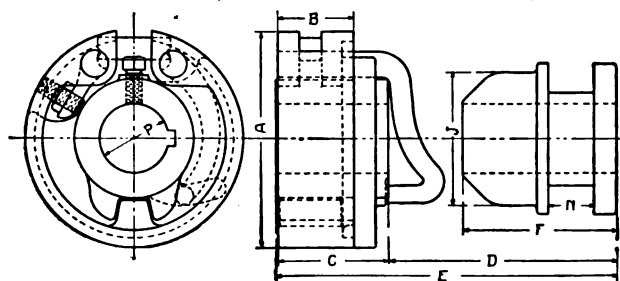


Conway Expansion Clutch

This expansion clutch not only increases the power factor of the machine to the very limit of the power developed, but also adds to the attractiveness of the product. It is a favorite with manufacturers of textile, bakery, printing and like machinery. When the shaft centers are close the expansion fits in ideally.



CONWAY EXPANSION CLUTCH



DIMENSION DIAGRAM CONWAY EXPANSION CLUTCH

Size of clutch	A	B	C	D	E	F	N	P	Travel
4	4	1 1/4	1 3/4	3 1/2	5 1/4	2 1/4	1/2	2	1 1/4
5 1/4	5 1/4	1 1/2	1 3/4	4	5 3/4	2 3/8	5/8	2 3/8	1 1/2
6	6	1 3/4	2 1/4	4 3/8	6 1/4	3 1/8	3/4	2 1/2	1 3/4
8	8	2	2 3/8	5	7 1/4	3 1/2	1	3	1 3/4
10	10	2 1/4	3	5 1/2	8 1/4	4	1 1/4	3	1 3/4

All dimensions in inches.

Demand for Conway Clutches

Following are some of the large and often-repeated "calls" for large numbers of Conway clutches coming from manufacturers of the equipment indicated: ten, dough mixers; ten, building conveyors; five, wagon loaders; five, hoists; three, soap presses; three, cranes; three, textile machines; three, concrete mixers; two, metal punch presses; one, paper cutter; one, shear; one, multiple drill; one, can filling machine; one, hog shaver; one, sugar mill. Also shop and special equipment from every engineer who is acquainted with them.

See former editions of SWEET'S ENGINEERING CATALOGUE for other applications.

Incorporate dependability into your product. See that it is Conway clutch equipped.



CONWAY COMPRESSION CLUTCH
APPLIED TO SPROCKET
These clutches make good under the most exacting conditions

CHICAGO PULLEY & SHAFTHING CO.

Power Transmitting Machinery

TELEPHONE
MAIN 1876

40 South Clinton Street
CHICAGO, ILL.

FACTORY, MENOMONEE FALLS, WIS.

Products

Manufacturers of the "CHICAGO LINE" of POWER TRANSMITTING MACHINERY which includes:

HANGERS: Cast Iron, Steel; Ball Bearing, Roller Bearing and Babbitted; Bracket Hangers, Post Hangers and Pillow Blocks, adjustable and rigid; Ball Bearing Hanger Boxes.

BEARINGS: Ball, Roller or Babbitted; Thrust (ball or roller).

COUPLINGS: Flange Plate, Compression, Flexible, Ribbed Compression, Friction Clutch, Spiral and Square Jaw Clutch.

PULLEYS: Wood Split, Steel Split and Cast Iron; Daggett Loose Pulleys (ball bearing) and Daggett Friction Clutch Pulleys (ball bearing).

COUNTERSHAFTS: Ball, Roller and Babbitted Bearing.

COLLARS: Safety Set, Solid and Split.

CLUTCHES: Friction Sleeve.

SHAFTING.

"ALL LOOSE" DRIVES (ball bearing).

MARVEL GRINDERS (ball bearing).

Also manufacturers of Wall Brackets; Wall Frames; Base and Sole Plates; Take-up and Clamp Boxes; Beam Clamps; Mule Pulley Stands (ball bearing); Pedestals; Sprockets and Gears; Sheaves and Flanged Pulleys; Belt Tighteners; Bench Legs.

Hangers

The "Chicago Line" offers both cast iron and steel hangers.

The "Chicago Line" cast iron hangers are of great strength, generously babbitted and of pleasing design; have duplex system of oiling—wick and ring combined.

The "Marvel" steel hangers have but one-third the weight of cast iron hangers, have double the strength,



TRADE-MARK

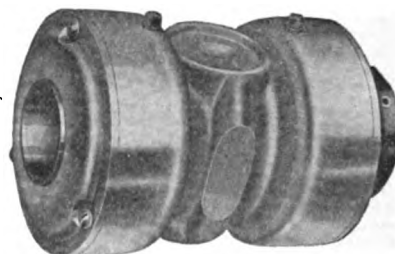
and cost no more. Danger of breakage is entirely eliminated.

Ball or roller bearings furnished with either type hanger when desired.

There is also a "Marvel" steel countershaft hanger. Made in any size required, or furnished as part of complete countershafts.

Ball Bearing Hanger Boxes

The "Chicago Line" ball bearing hanger box removes the last objection to ball bearings for line-shaft use. It will fit all types of hanger frames, and is furnished in all standard line shaft sizes.



"CHICAGO LINE" BALL BEARING HANGER BOX

Pillow Blocks

The "Chicago Line" pillow blocks are furnished in rigid or adjustable types with plain bores or the duplex system of oiling.

Adjustable pillow blocks can be fitted with ball or roller bearings when desired.

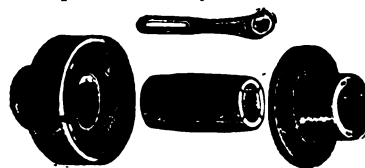


"CHICAGO LINE" PILLOW BLOCK

Couplings

The "Chicago Line" couplings are the flange plate, compression, ribbed compression, flexible, square and spiral jaw, as well as other types.

The compression type is of the taper sleeve construction that requires no keys.



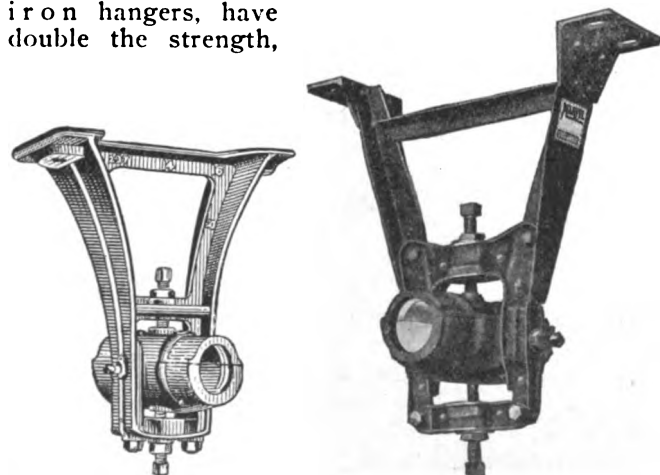
"CHICAGO LINE" COMPRESSION COUPLING

Collars

Complete line of safety set Collars—solid and split.

Daggett Ball Bearing Loose Pulleys

The "Chicago Line" ball bearing loose pulleys are especially designed for high speed. They are simple in construction, accurately machined and will carry a belt at any working load or speed without heating or sticking. They are dustproof, clean, noiseless and



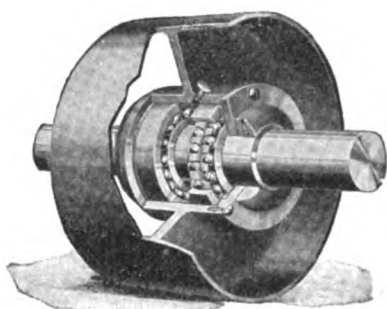
"CHICAGO LINE" CAST IRON HANGER

"MARVEL" STEEL LINE SHAFT HANGER

require but a small amount of lubricant a few times a year.

This loose pulley eliminates the loose pulley trouble prevalent in practically every plant where loose pulleys are used.

S K F ball bearing equipped.



DAGGETT BALL BEARING LOOSE PULLEY

Daggett Ball Bearing Friction Clutch Pulley

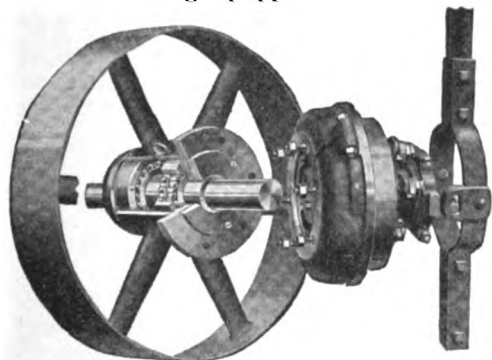
A friction clutch pulley designed and guaranteed to carry any belt load at any speed without bearing trouble.

Drive buffing lathes, emery and disk grinders, fans, punch presses, etc., direct from lineshaft with a ball bearing friction clutch pulley and save power, belts, lubricant, time and trouble.

The ball bearing friction clutch pulley illustrated below will not wear the shaft, is simple in construction, easy to install and requires less space on the shaft than ordinary clutches.

The ball bearings are dustproof, and the lubricant chamber needs refilling but from two to four times a year, according to conditions.

S K F ball bearing equipped.

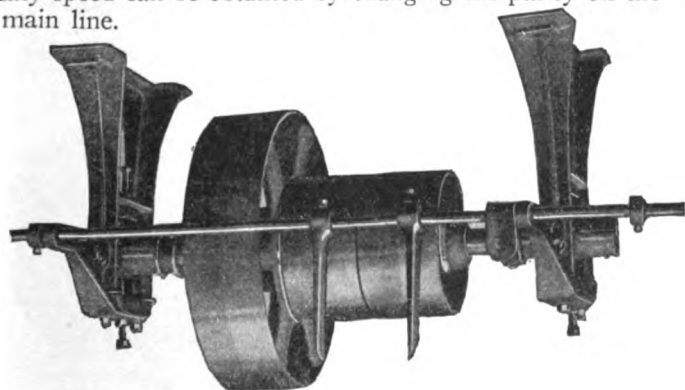


DAGGETT BALL BEARING FRICTION CLUTCH PULLEY

"All Loose" Drive Countershafts, Ball Bearing

A countershaft with stationary shaft, another way to eliminate countershaft trouble and worries. The shaft is stationary—it does not revolve. The small driven pulley and the large driving pulley are cast as one. The additional loose pulley is the idler.

The "all loose" countershaft drive can be made in any combination of pulley sizes that may be required; any speed can be obtained by changing the pulley on the main line.

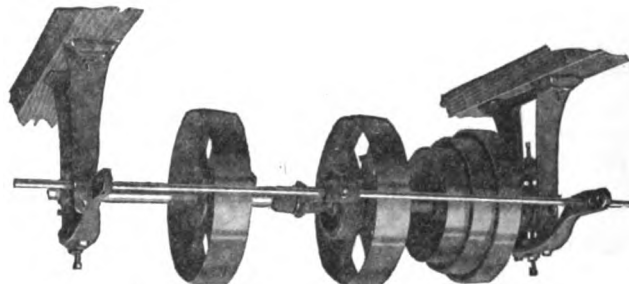


"ALL LOOSE" DRIVE COUNTERSHAFT

Ball Bearing Countershafts, Ordinary

The "Chicago Line" are headquarters for all types of countershaft, but recommend at all times ball bearing equipment.

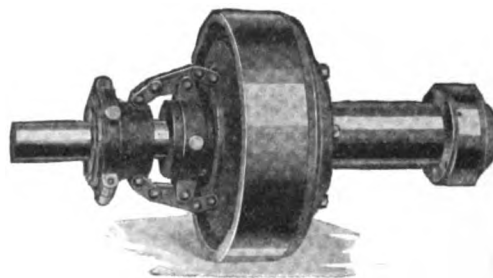
A countershaft with ball bearing friction clutch pulleys and ball bearing hangers will pay for itself in trouble saved in a short time, for wherever plain bab-bitted bearings are used in countershafts, there is a constant liability of trouble.



BALL BEARING COUNTERSHAFT

Friction Sleeve Clutch, Ball Bearing

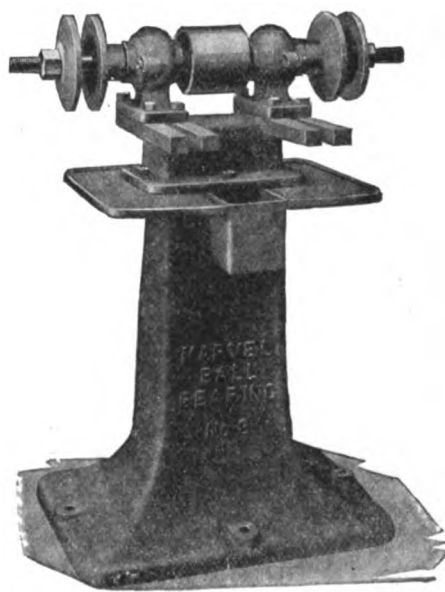
An exceptionally good friction clutch, well designed and constructed. Compact, strong and easily applied. Is made with an extended sleeve to accommodate pulleys, sheaves, gears, sprockets, etc.



BALL BEARING FRICTION CLUTCH, SLEEVE TYPE

Marvel Grinder

The marvel grinder, ball bearing equipped, permits high spindle speeds with an assurance of long life, low upkeep and continuous service.



MARVEL GRINDER

THE CORK INSERT COMPANY

166 Federal Street
BOSTON, MASS.

Products

CORK INSERT PULLEYS: Cast Iron, Paper, Steel, Wood Rim Iron Center, to meet all requirements.

CORK INSERT FACINGS, BANDS, CONES OR DISKS for clutches, brakes and slipping tensions.

Also manufacturers of Friction Wheels, Cone Clutches, Clutch Facings, Disks and Blocks, Friction Washers and other guaranteed Frictional Devices equipped with Cork Inserts for use where great efficiency or uniform tension is necessary.

Cork Insert Pulleys

Advantages—Cork Insert pulleys are made to any specifications to transmit any power a belt can carry and *they are guaranteed* to give satisfaction in the places for which they are designed.

They transmit more power than plain pulleys, stop belt slip, maintain efficiency under unfavorable conditions, and are not affected by dampness.

They prevent loss from oily belts or dust, maintain speeds in spite of water, deliver power with slack belts, cut down friction loads, and lessen wear on bearings.

They lengthen the life of belts, and eliminate use of belt dressing, thus reducing cost of upkeep.

They give uniform speeds, improve quality and quantity of products, and save fuel and electric current.

Applications—Main drives, motors, fans, blowers, air compressors, wood working machinery and all drives

where speeds are high and loads heavy; machine tools, textile and other machinery where output and uniform operation are especially important; pumps, paper mill machinery, dyeing machines, tanning machinery, sugar grinders, stone crushers, cement mill machinery, milling machinery, polishing machinery and all places where conditions are necessarily bad: these are a few typical cases where Cork Inserts are giving the most satisfactory results.

In one form or another, Cork Inserts are adapted to practically every place where it is necessary to *obtain the greatest possible frictional efficiency or a uniform tension.*

Directions for Ordering—When ordering Cork Insert pulleys or requesting quotations, give the following information:

Quantity; type of pulley (specify iron, paper, wood rim or steel); solid or split; crown or flat face; diameter; actual width of face; width of belt; bore; length of hub (standard is two-thirds width of face); projection of rim beyond end of hub; width and depth of keyway; number and location of setscrews.

If pulley must fit over parts of machine, send sketch or give outside diameter of hub and inside diameter of rim.

Describe drive, stating whether it is from motor, engine or shaft to machine (giving name and size) or shaft; distance between pulley centers; horsepower; speed of driving pulley; whether pulley described is driver or driven; whether drive is horizontal, vertical or diagonal—open, quarter-turn or crossed; if horizontal or diagonal, whether tight side of belt is on top or bottom, and if vertical or diagonal, whether driving pulley is at top or bottom; diameter and face of pulley at other end of drive.

Give material, thickness (single, double or number of ply) and width of belt.

State troublesome conditions, if any.

Co-operative Service

Transmission problems are analyzed, and recommendations for equipment guaranteed to give satisfactory service are made without charge or obligation.

Catalogue illustrating many successful applications and giving detailed reports of tests sent on request.

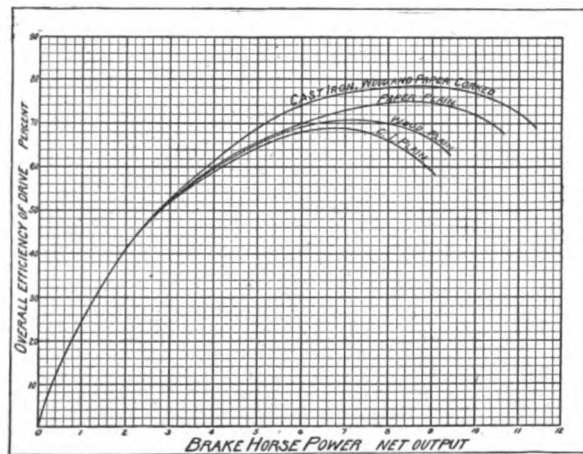
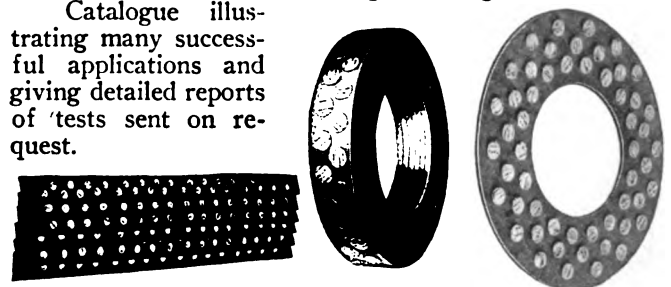


DIAGRAM ILLUSTRATING COMPARATIVE EFFICIENCY OF CORK INSERT PULLEYS AND OTHER TYPES

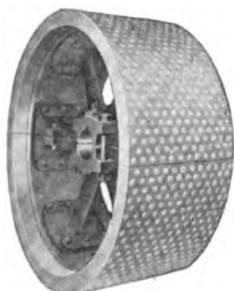
Compiled from tests made at Lowell Textile School, Lowell, Mass.



CORK INSERT BRAKE FACING

CORK INSERT
FRICTION
FILLER

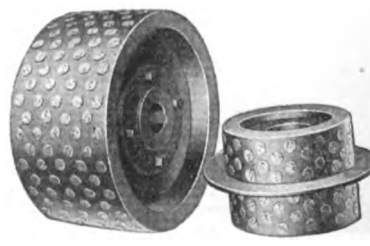
CORK INSERT
FRICTION DISK



Wood Rim



Steel



Paper



Cast Iron

CORK INSERT PULLEYS—WOOD RIM, STEEL, PAPER, AND CAST IRON
To meet the heaviest requirements of motors, machinery and shafting

THE HILL CLUTCH CO.

Power Transmission Machinery
CLEVELAND, OHIO

EASTERN SALES OFFICE: NEW YORK, N. Y., 50 Church Street—Telephone, Cortlandt 8078

Products

HILL COLLAR OILING BEARINGS; HILL FRICTION CLUTCHES (Smith Type).

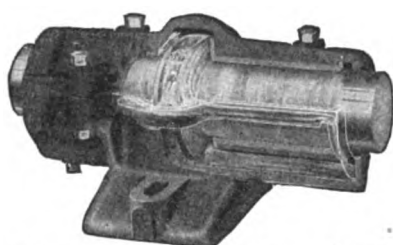
Also manufacturers of Hill Rope Drives, Belt Tighteners, Drop Hangers, Floor Stands, Shafting, Couplings, Cast Iron Pulleys, Rope Sheaves, Gears, Sprockets, Flywheels, Bench Legs, Concrete Inserts, Gray Iron Castings, Special Machinery.

Hill Collar Oiling Bearings

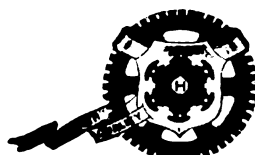
In the Hill Collar Oiling Bearing, instead of depending upon a loose ring or chain for conveying the oil to the journal, a fixed collar is employed, thus providing a positive means of elevating the oil.

In the Cleveland Type Hill Collar Oiling Bearing, the oil stored in a reservoir in the bottom of the bearing is continuously elevated by a heavy split collar. Metal wipers deflect the oil, which is then distributed along the full length of the journal. Two or three revolutions of the shaft and the bearing is thoroughly lubricated. It is not only in the positive and copious means of oiling that the Collar Oiling Bearing excels, but the collar also serves as a thrust collar, and operates in a bath of oil and thrusts against babbitted seats. No outside collars are required unless the end thrust is extremely severe. All other types of bearings require outside shaft collars, which bear iron against iron with no lubrication.

Hill Collar Oiling Bearings are furnished in all styles of ball and socket and rigid mountings.



SECTIONAL VIEW HILL COLLAR OILING BEARING, CLEVELAND TYPE (Patented)



TRADE-MARK

manufacturing of friction clutches and complete power transmission machinery equipment or a greater knowledge of the varying conditions of operation that must be met.

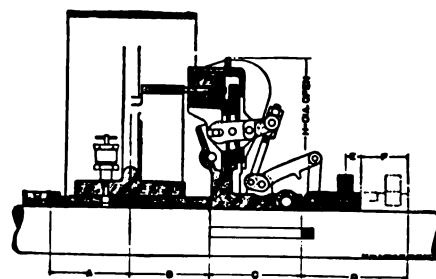
Efficiency—The advantages of the Smith Type Hill Clutch lie in its unequalled mechanical stability, tremendous starting

power, ease of adjustment, and removal of wearing parts.

To obtain such rigidity, all parts of the toggle mechanism are of steel and forgings, with the single exception of the connecting lever which is of cast iron.

The friction surfaces are wood to iron, which is a combination offering great frictional resistance. The wood shoes are made from the best grade of well seasoned maple. Large shoe area is supplied and all of the shoe area is equally effective.

The frictional resistance is the same at all points. This is due to the heavy cast iron jaws, rigid guides and the balanced toggle action transmitting the pressure effort of the operator.



DIMENSION DIAGRAM, HILL FRICTION CLUTCH PULLEYS—SOLID OR SPLIT

SINGLE ARM PULLEY

Diameter, in.	12	13	14	15	16	17	18 & 19	20 & 21	22 to 35, incl.	36 to 47, incl.	48.....
Face, in.	13	14	15	16	17	18	19	20	21	22	24

STANDARD BEARING LENGTHS FOR CLUTCH PULLEYS

Face, in.	4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	9 1/2	10 1/2	11 1/2	12 1/2	14	15	16	17
A plus B, in.	7	8	9	10	11	12	13	14	15	16	17	18	19

Face, in.	18	19	20	21	22	23	24	25	26	27	28	29	30
A plus B, in.	20	20	20	22	22	24	24	26	26	28	28	30	30

SPACE ON SHAFT FOR FRICTION CLUTCH

H. p. at 100 r. p. m.	9	12	15	20	27	35	45	60	75	90
C, in.	4 1/8	4 1/4	5	5 5/8	6 3/8	7 1/8	8 1/2	10	11 1/8	12 1/2
D, in.	5	5 1/4	5 1/2	6 1/4	7 1/4	8 1/4	9 1/4	10 1/4	11 1/4	12 1/4

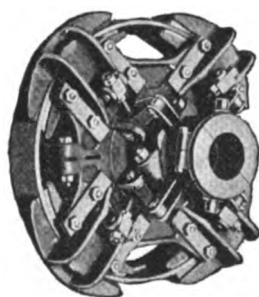
H. p. at 100 r. p. m.	110	140	175	230	350	480	625	875	1100	1300
C, in.	9 1/4	9 3/4	11	12	12	14	17	18	19	20
D, in.	9 1/2	10 1/2	11	11	11	12	14 1/2	16	18	20

"A" = "B" for all pulleys.

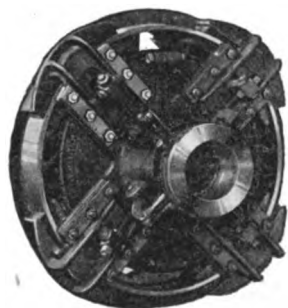
Pulleys having faces wider than those listed will be furnished with 2 sets of arms.



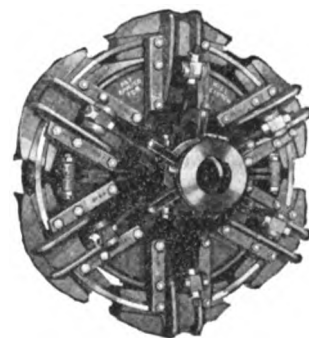
Three-arm—9 to 45 H.p., Inclusive



Four-arm—60 to 90 H.p., Inclusive



Four-arm—110 to 230 H.p., Inclusive



Six-arm—350 to 1300 H.p., Inclusive

FOUR DESIGNS OF HILL SMITH TYPE FRICTION CLUTCH

DODGE SALES AND ENGINEERING COMPANY

DISTRIBUTER OF THE PRODUCTS OF
DODGE MANUFACTURING COMPANY AND DODGE STEEL PULLEY CORPORATION

Power Transmission Machinery

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MISHAWAKA, IND.

MANUFACTURING PLANTS

MISHAWAKA, IND.
ONEIDA, N. Y.
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SALES OFFICE NOT CARRYING STOCK
HOUSTON, TEX., 1008 Scanlon Building

Dealers Carry Complete Stocks in All Principal Cities

Products

A complete line of POWER TRANSMISSION MACHINERY, including DODGE ROPE DRIVING EQUIPMENT; SAFETY COLLARS; KEYLESS COMPRESSION COUPLINGS; ADJUSTABLE BALL and SOCKET DROP HANGERS; BEARINGS; FRICTION CLUTCHES; CAST IRON GEARING. PULLEYS of all sorts: "INDEPENDENCE" WOOD SPLIT, "STANDARD" SPLIT IRON, IRON CENTER WOOD RIM; "ONEIDA," "KEYSTONE," and "NATIONAL" STEEL.

Also manufacturers of Flywheels, Rope Sheaves, Split Bushings for tight and loose pulleys, Wood Lagging for rope wheels; in fact everything for the mechanical transmission of power.

For Heavy Oil Engines, see page 606.

Engineers

Through more than 30 years' experience in meeting transmission problems in every line of industry, Dodge engineers are prepared to give competent service in the selection and arrangement of transmission equipment for maximum efficiency and economy.

Dodge Rope Driving Equipment

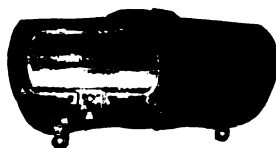
This company is the originator of the American system of rope driving, and is best equipped to give to every important detail of design and manufacture that careful and experienced attention so necessary to insure successful and economical operation. Equipment for English system rope drives is also manufactured by this company.

Dodge Keyless Compression Couplings

The design of the Dodge coupling is excellent and its construction so simple that an ordinary workman can erect it as satisfactorily as a skilled mechanic or millwright. The only care needed is to tighten all bolts gradually and evenly to insure true running.



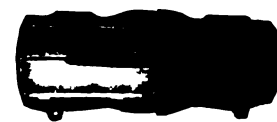
DODGE KEYLESS
COMPRESSION
COUPLING



Capillary Type



Ring Type



Standard Type

TYPES OF BEARINGS USED IN DODGE HANGERS

Dodge Adjustable Ball and Socket Hangers and Bearings

Adjustable ball and socket drop and post hangers are made with three types of bearings: capillary type, ring type, and standard.

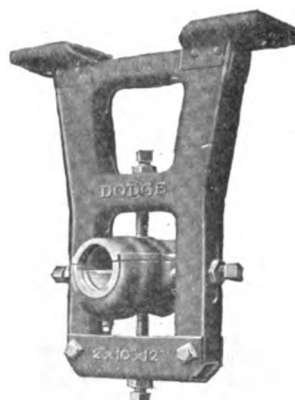
Capillary Type—This bearing is mechanically and scientifically correct in every detail.

The Dodge patent capillary oiler is a wooden block, with alternate saw cuts, through which the oil rises by capillary attraction from reservoir to the shaft. The capillary oiler is a non-agitating oiler. There is not the slightest whipping and churning of the oil. Any sediment precipitates to the bottom of the reservoir and only the good clear oil is brought up to the shaft.

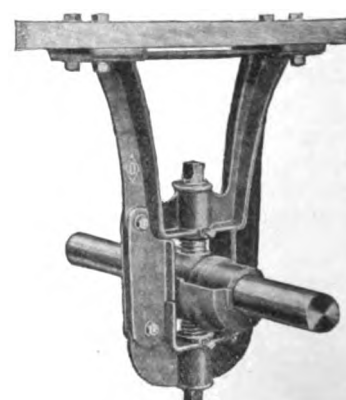
The action of the capillary oiler is definite and positive and can be relied on absolutely. It can not fail.

Ring Type—In this bearing the well-known method of oiling by rings is employed, in connection with a bearing of the most superior design and finish.

Standard Type—This plain oiling type of bearing is exceptionally well made for a bearing of this kind, and is relatively inexpensive.



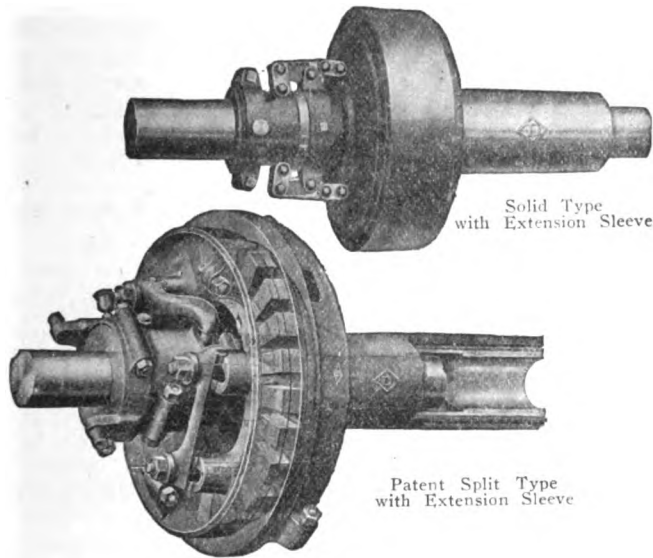
DODGE PRESSED STEEL
HANGER



DODGE ADJUSTABLE BALL AND
SOCKET DROP HANGERS

Dodge Friction Clutches

These clutches are manufactured also in the form of cut-off couplings. All sizes, to meet all conditions of service.



DODGE FRICTION CLUTCHES

Dodge "Independence" Wood Split Pulleys

Rim machined inside and out. Pulley is accurately balanced, runs true, grips shaft securely and has greater transmitting efficiency than any metal pulley.

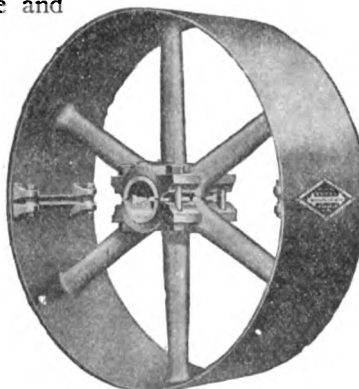
Made in all sizes and carried in large stocks for instant shipment by all branches and by hundreds of leading dealers. Special sizes made and shipped within 24 to 48 hours from receipt of order.



DODGE "INDEPENDENCE" WOOD SPLIT PULLEY

Dodge "Standard" Split Iron Pulley

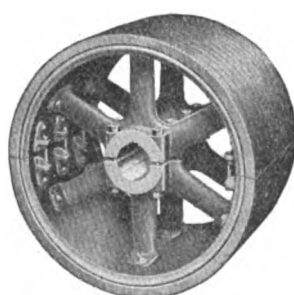
Carried in stock. Made with interchangeable metallic bushings.



DODGE "STANDARD" SPLIT IRON PULLEY

Dodge Iron Center Wood Rim Pulley

Split Type—Single Arm



Split Type—Double Arm

DODGE IRON CENTER WOOD RIM PULLEYS

Rim is machined inside and out. Pulley is carefully balanced and accurately finished in every detail, and is made solid or split.

"Oneida" Steel Split Pulley

These pulleys are light and strong—no excess weight. They reduce friction on bearings and save power. Oval crown gives greatest possible belt grip—allows operation under low belt tension. Arms securely riveted to broad bearing and set edgewise, thus offering least air resistance. Metals are countersunk, no shearing strain on rivets. Setscrews and keyways are avoided. Oneida pulleys are built "double arm" in sizes from 8 in. face in smaller sizes, 10- and 12-in. face in medium and large sizes.



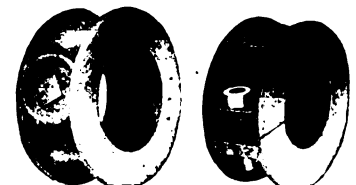
"ONEIDA" STEEL SPLIT PULLEY

"Keystone" Steel Split Pulleys

Substantial grooveless rim, no seam in center of face to lessen belt tension, no beads or turnover edges to catch dirt, lint, sawdust, etc. These pulleys are accurately turned and faced on edges assuring perfect balance and true running. Metals through which rivets pass are countersunk, no shearing strain on rivets. Double arms are provided beginning with 8-in. face in the smaller sizes, 10- and 12-in. face in the medium and larger sizes.

"KEYSTONE" STEEL SPLIT PULLEY
Sizes, 17 to 40 in. in diameter**Dodge Safety Collars**

Dodge safety collars are made solid and split for all sizes of shafting, and comply with all the legal requirements as to safety by having setscrews and bolts protected. Finished and polished on periphery and faced on ends.

Solid Split
DODGE SAFETY COLLARS**Cast Iron Gearing**

A complete line of cast iron gears is manufactured.



Bevel



Spur



Miter

DODGE CAST IRON GEARING

W. A. JONES FOUNDRY & MACHINE COMPANY

Speed Reducers and General Power Transmitting Machinery

MAIN OFFICE AND FACTORIES

4403 West Roosevelt Road

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BRANCH SALES AND ENGINEERING OFFICES

NEW YORK, N. Y., 20 Murray Street

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Stock carried at New York City Branch and by Dealers in all important distributing centers

Products and Services

SPUR GEAR SPEED REDUCERS; ENCLOSED WORM GEAR DRIVES; FRICTION CLUTCHES; CAST IRON SPLIT and SOLID PULLEYS; BALL BEARING LOOSE PULLEYS; CUT and CAST GEARS of all types and materials; SAFETY SET COLLARS; SHAFT HANGERS; PILLOW BLOCKS; RIGID and FLEXIBLE COUPLINGS.

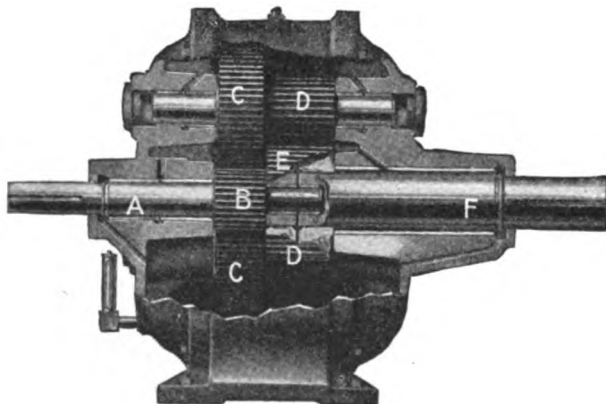
MISCELLANEOUS FOUNDRY and MACHINE REPAIR WORK.

Also Clutch Pulleys, Sprocket Wheels, Rope Drives, Belt Tighteners and Mule Stands.

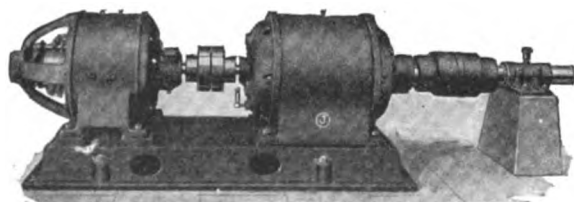
Spur Gear Speed Reducers

Jones spur gear speed reducers are designed for use between electric motors and driven machines or shafts. All gears are completely enclosed in a dustproof, fumeproof housing, which carries a sufficient supply of oil to keep all gears and bearings well lubricated.

All gears and shafts are made from special analysis steel; the gear teeth are of the cut stub involute type 20° pressure angle. Pinion "B" (see illustration below) is a part of high speed shaft "A," meshing with and driving three countershaft gears "C." Three pinions "D" are a part of the same countershafts which gears "C" are mounted on, meshing with and driving the one gear "E" which is mounted on low speed shaft "F."



SECTIONAL VIEW, SPUR GEAR SPEED REDUCER, SINGLE TYPE



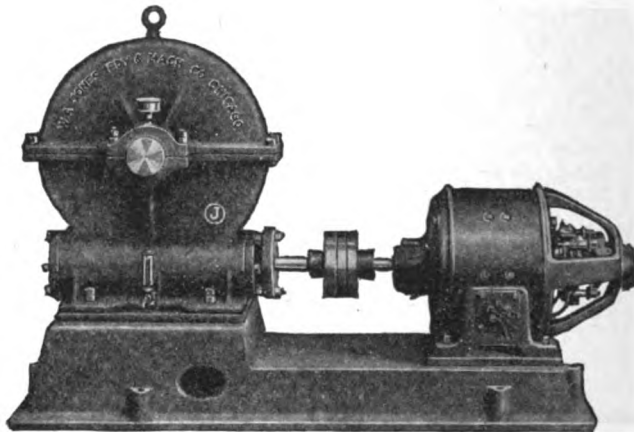
SPUR GEAR SPEED REDUCER MOUNTED ON CAST IRON BASE
COUPLED TO DRIVEN SHAFT

Note that there are no overhanging shafts or internal gears. Just straight spur gear drives with liberal bronze bushed bearings close on either side providing a rigid support.

Jones reducers are made to transmit any load up to 200 h.p. and for practically any speed reduction up to 200 to 1. Exceptionally large ratios can be obtained by using a combination of spur and worm gear reducers.

Enclosed Worm Gear Drives

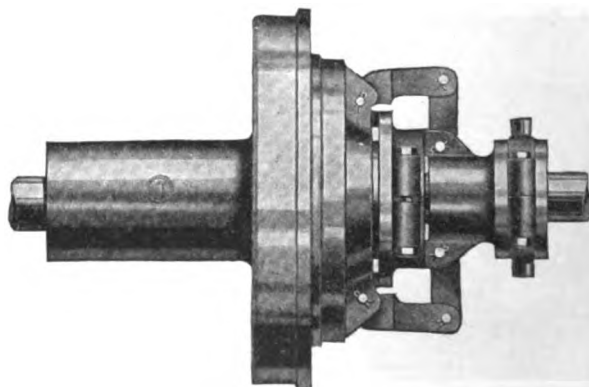
Furnished either individually or mounted on a cast iron base with flexible coupling and motor as shown below. Ball bearing thrust collars provided at both ends of worm. Send your specifications.



WORM GEAR DRIVE WITH MOTOR MOUNTED ON CAST IRON BASE

Lemley Friction Clutches

Furnished with extended sleeves on which can be placed cast iron, steel or wood pulleys, sprocket wheels, gears or sheave wheels. Also furnished as cut-off couplings or bolted to the arms of cast iron pulleys, etc. This



LEMLEY STYLE "O" FRICTION CLUTCH WITH EXTENDED SLEEVE

latter method will cost somewhat less than where the driving member is mounted on the sleeve.

The friction is between cast iron and wood, fiber or burnproof surfaces. All clutches are designed amply strong with power to spare. Over 30,000 are in use today and giving satisfaction. Tell us what the conditions are and we will tell you whether you need a friction clutch or not.

Furnished in sizes as large as for 140 h.p. at 100 r.p.m.

Cast Iron Pulleys

Made in all diameters as large as 12 ft., any face width up to 72 in., and for any shaft diameter. Either solid or split with key seat, set screws or both and balanced. Accurately bored and turned. When ordering, give all dimensions, specifying either crown or straight face.

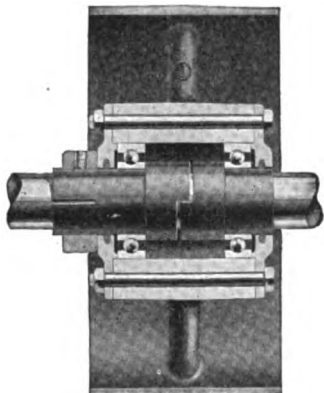


CAST IRON PULLEY

Lemley Ball Bearing Loose Pulleys

Very simple in construction and of few parts. High grade ball bearings used. Where ordinary bored or bushed loose pulleys will not stand up, a Lemley ball bearing pulley will in most cases do the work without giving any trouble.

Write for list prices and latest discounts.



LEMLEY BALL BEARING LOOSE PULLEY

Cut and Cast Gears

Furnished in all commonly used materials, such as cast iron, cast steel, forged steel, rawhide, bakelite, bronze, etc. Thousands of patterns on hand for cast tooth gears and blanks for cut gears.

Made as spur gears, bevel gears, miters, worm gears and worms, spiral gears, etc. Let us quote on gear requirements.



CUT GEAR AND RAWHIDE PINION

Safety Set Collars

Furnished for all sizes of shafting; carried in stock in all standard sizes.



Solid

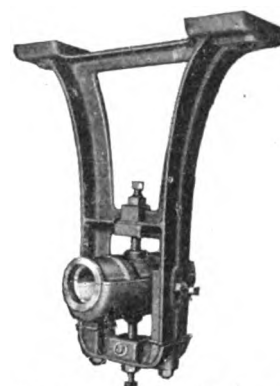


Split

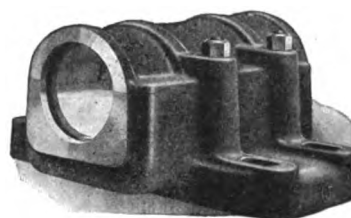
SAFETY SET COLLARS

Lineshaft Equipment

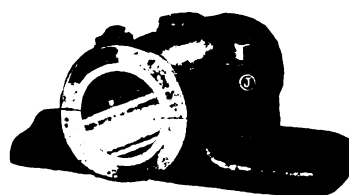
Our line includes many types of hangers, pillow blocks, couplings, collars, etc. Catalog No. 20-A illustrates and describes this line, showing list prices and dimensions. Send for your copy with latest discount sheet.



UNIVERSAL DROP HANGER



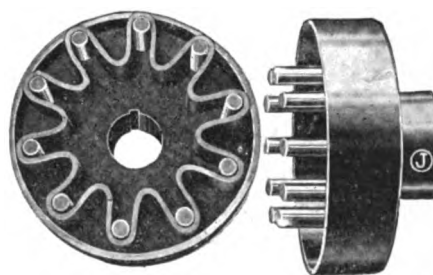
DUPLEX OILING RIGID PILLOW BLOCK



PLAIN OILING RIGID PILLOW BLOCK



FLANGED COUPLING



STYLE "B" FLEXIBLE COUPLING

Repair Work

Exceptionally prompt attention is given to all orders for repairs, so that lost time due to breakdowns is reduced to a minimum.

KAY MANUFACTURING CO.

Manufacturers of Shaft Couplings

NORWALK, CONN.

Product

WHITNEY FREE FLOATING (FLEXIBLE) COUPLINGS.

Function of the Whitney Free Floating Coupling and Its Distinctive Features

The function of the Whitney free floating coupling is to take care of shaft misalignment *without causing strains in the shafts or bearings.*

This is accomplished by the power being transmitted through the free floating center link which fits into sockets in the hubs so that it is free to rock in any direction and float laterally, and yet is of such design as to give a positive drive.

The action of these couplings is in no way accomplished by the bending or otherwise distorting of any of its members (and therefore limited by the fatigue or breaking down of material), but is due entirely to the geometric design of the center link.

Whitney free floating couplings transmit true rotary motion at any offset.

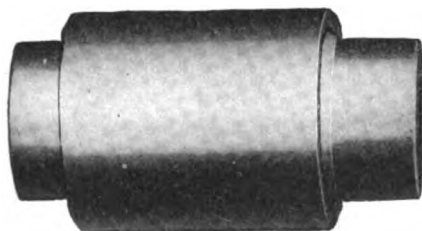
There are no protruding pins, bolts or nuts to endanger workmen.

Built for endurance; no small driving parts, no flexible materials to break down or wear out. Simple, solid, all-metal construction.

Simple to install; no close adjustments.

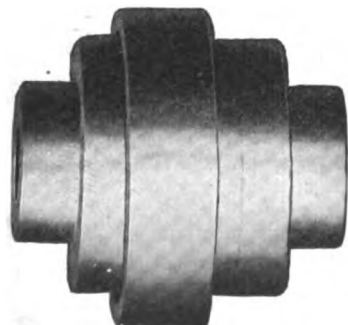
No attention required after proper installation.

Types of Whitney Couplings



TYPE B WHITNEY COUPLING

Type C—Designed to allow shafts to be removed without any lateral motion or "sliding back" of machines.



TYPE C WHITNEY COUPLING

Type B—Hub fits into a cylindrical steel casing. The latter serves to protect the couplings from dirt and grit and also offers a smooth, safe exterior.

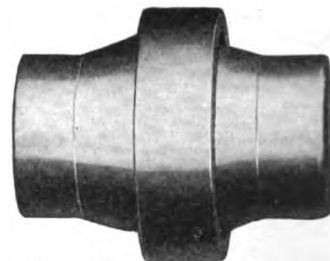
Sockets are in rings, one of which is constructed with a protecting hood so that the *entire center section may be lifted out without disturbing the shafts.*

This is also advantageous in many installations, for the machines may be lined up and bolted in place before coupling is assembled.

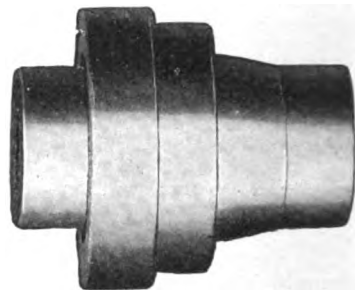
Type D—Built for simplicity; there are only three parts. One of the hubs is built with a protecting hood. Coupling is assembled by sliding together.

Type E—An angle coupling designed to take thrust or pull and yet allow for end float. One hub is constructed with a retaining flange into which the other hub fits and coupling is held together with a retaining ring.

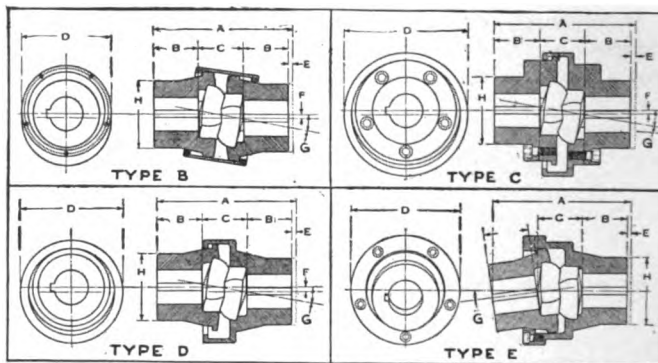
Extremely simple, durable and safe.



TYPE D WHITNEY COUPLING



TYPE E WHITNEY COUPLING



DIMENSION DIAGRAMS OF WHITNEY FREE FLOATING COUPLINGS
DIMENSIONS (IN INCHES)

*Size No.	Normal bore up to	H.p. per 100 r. p. m.	A	B	C	D				E	F	G	H
						Type "B"	Type "C"	Type "D"	Type "E"				
4	1 1/2	2.0	3 7/8	1 1/2	1 1/2	2 1/4	4	2 3/8	4 1/4	3 1/8	1/2	2	1 3/8
5	1 3/4	2.5	4 1/16	1 3/4	1 3/4	2 3/4	4 1/2	3	4 3/4	3 1/4	1/2	2	2 1/4
6	1 7/8	3.6	5 1/8	1 7/8	1 7/8	3 1/4	4 3/4	3 1/4	4 7/8	3 1/2	1/2	2	2 3/4
8	2	6.3	6 5/8	2 1/8	2 1/8	4 1/2	6 1/8	5	5 3/4	3 3/4	1/2	2	3 1/8
10	2 1/4	15.0	8 3/8	2 3/8	2 3/8	5 1/2	7 1/8	5 1/2	6 3/4	3 3/4	1/2	2	3 3/4
12	2 3/4	29.2	9 1/2	3	3	6	8 1/4	6 1/2	7 1/2	3 3/4	1/2	2	4 1/2
14	3	50.5	11	3 1/2	3 1/2	7	9 3/8	7 1/8	8 1/2	3 3/4	1/2	2	5 1/2
16	3 1/4	80.0	12 1/4	4	4	8	11 1/4	8 1/8	9 3/4	3 3/4	1/2	2	6 1/4
20	4 1/2	171.0	15 1/2	5	5	10	13 7/8	11 1/8	11 3/4	3 3/4	1/2	2	7 1/4
24	5 1/2	312.0	18 3/4	6	6	12	15 7/8	13 1/8	13 3/4	3 3/4	1/2	2	8 3/8
28	6 1/2	514.0	21 3/4	7	7	14	18 1/8	15 1/8	15 3/4	3 3/4	1/2	2	11
32	7 1/2	810.0	24 3/4	8	8	16	21 1/4	17 3/8	17 3/4	3 3/4	1/2	2	12 3/4
36	8 1/2	1162.0	27 3/4	9	9	18	24	19 3/8	19 3/4	3 3/4	1/2	2	14 3/8
42	10	1875.0	32 1/2	10 1/2	10 1/2	21	27 3/4	22 3/8	22 3/4	3 3/4	1/2	2	17 1/2
48	11 1/2	3000.0	36 3/4	12	12	24	31 3/4	25 3/8	25 3/4	3 3/4	1/2	2	21

All couplings are furnished with finished straight bore and keyways as specified by purchaser. Safety setscrews and setscrew wrench furnished where required. Taper, special bores and keys extra.

* Specify type letter when ordering by size number.

‡ Maximum angle in inches per foot.

Information Required for Estimates

Horsepower to be transmitted; revolutions per minute; diameter of driving shaft and size of keyway; diameter of driven shaft and size of keyway.

THE KINNEY MANUFACTURING CO.

Manufacturers of Friction Clutches and Cut-off Couplings

3529-3541 Washington Street
BOSTON, MASS.

BRANCH OFFICES

NEW YORK, N. Y.

PHILADELPHIA, PA.
SAN FRANCISCO, CAL.

CHICAGO, ILL.
HOUSTON, TEX.

KANSAS CITY, MO.

Products

FRICTION CLUTCH PULLEYS and CUT-OFF COUPLINGS.

For Road Oiling Equipment, see page 63; for Pumps and Strainers, see pages 634-635.

Interchange Clutch (Pulley or Cut-off Coupling)

Seven sizes, 2 to 40 h.p. per 100 r.p.m.

As the name implies this clutch may be used on the driving or driven end of a belt, chain or gear drive, or by exchanging the long sleeve member for a short hub member it may be used as a cut-off coupling.

In construction this clutch is the simplest friction

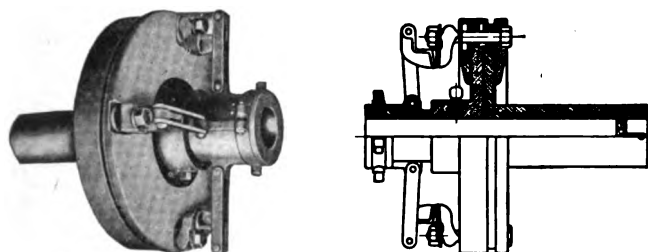
By the use of the ball guide bearing, the principal cause of cut-off coupling trouble is eliminated. It keeps the shafts in line and eliminates lubrication troubles.

Oiltight Clutch

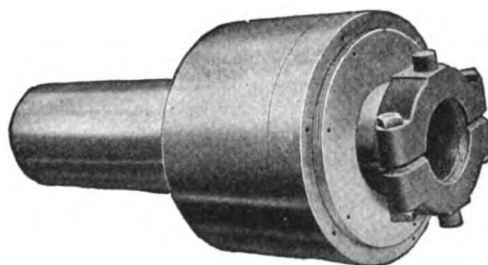
Eight sizes, 2 to 80 h.p. per 100 r.p.m.

The smallest friction clutch made per horsepower. As the case is oiltight it may be filled with oil, which insures thorough lubrication of all working members.

It is made with single or multiple disks, depending upon the horsepower required for the speed and space available.



INTERCHANGE PULLEY CLUTCH



THE OILTIGHT CLUTCH

clutch made. When clamped together it forms a solid bolt coupling.

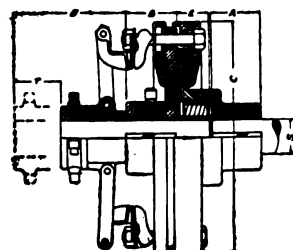
The power is transmitted directly through the two substantial flat disks and not through bolts, loose joints or working parts.

This clutch is practically indestructible. The wear of the parts does not affect their power or efficiency. They seldom need adjustment or repairs.

These friction pulleys are a perfect substitute for tight and loose pulleys. They possess many advantages not possible to obtain by the use of tight and loose pulleys. They do away with the shifting of belts, which is a source of much annoyance and expense. They provide a safety device against accidents and eliminate strains on belting and machinery.

They can be furnished with wick oiled cast iron sleeve or ball bearing sleeve as desired.

To convert the interchange pulley clutch into a cut-off coupling, the disk with long sleeve is exchanged for a ball bearing short hub disk, as shown in line drawing. The bore of this disk is the proper size to drive tightly on the driving shaft.



CUT-OFF COUPLING

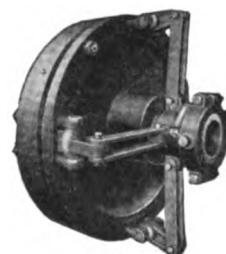
Cut-off Coupling (Worrall Type)

Six sizes, 65 to 1200 h.p. at 100 r.p.m.; 200 to 2000 h.p. at 300 r.p.m.

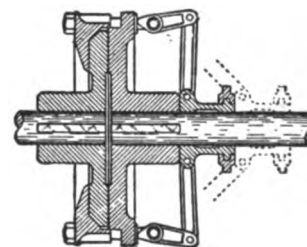
This clutch has been on the market for a great many years and has demonstrated its superiority over all other clutches for heavy duty.

Power is directly transmitted through the two flanges keyed firmly to the shafts and not through bolts, loose joints or working parts. When disengaged the flanges are entirely separated, eliminating all friction.

The clutch and shafts are automatically centered when in use by the bevel face disk. This is the only positive method of centering heavy shafts. There is no end thrust upon the shifter or shaft bearings.



C51



CUT-OFF COUPLING

ROYERSFORD FOUNDRY & MACHINE CO.

Manufacturers of Power Plant Specialties

FACTORY

ROYERSFORD, PA.

SALES OFFICE: 52 North Fifth Street, PHILADELPHIA, PA.

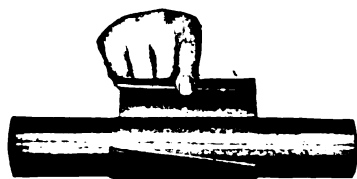
Products

"SELLS" ROLLER BEARINGS; COMPRESSION COUPLINGS; UNIVERSAL RING OILING HANGERS; SAFETY SET COLLARS; BRACKET HANGERS; PILLOW BLOCKS; COMBINATION OIL OF GREASE GUNS; "ROLLERINE," the ball and roller bearing lubricant.

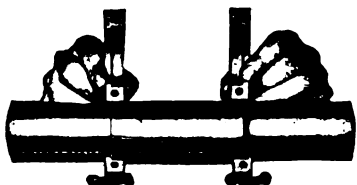
Also manufacturers of Power Transmission Machinery, Grinders, Shears, Punches, Dies, Sensitive Drill Presses, Foot Presses, Grinding and Polishing Machines, Tumbling Barrels.

Roller Bearings

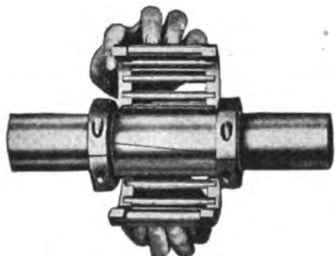
"Sells" roller bearings are made single and double roller structure, the single type being adaptable for all ordinary service. The double structure is intended for exceptionally heavy belt pulls, such as are found near most driving pulleys.



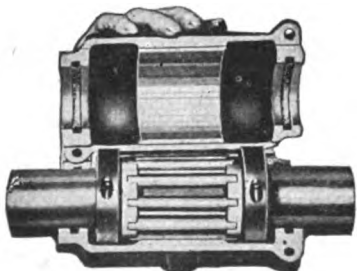
The Split Bushing



The Split Collar



The Split Roller Structure



The Split Box

DETAILS OF "SELLS" SINGLE ROLLER BEARINGS

Guarantee—In back of "Sells" roller bearings is a guarantee that it will cut the friction load in half, and reduce power costs at least 10%.

Construction—
"Sells" roller bearings are split throughout and are therefore easily applied to existing shafting. And they fit practically all hangers, post hangers and pillow blocks. An exclusive feature of "Sells" roller bearings is the sleeve of high carbon steel that fits over the soft shaft, covering the ridges and gullies worn by the former bearing and protecting the shaft from future wear.

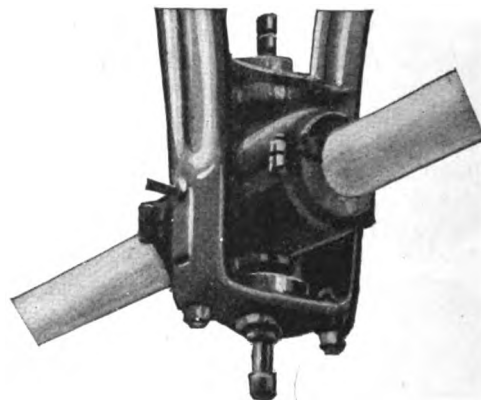
There is a lining of similar high carbon steel in the raceway of the housing to protect it from wear.

The rollers are held apart and parallel to each other, the shafting and the raceway; in addition, the "Sells" roller bearing is a full floating type.

Friction is obviously eliminated at every point.

References—Sells roller bearings have been installed in thousands of factories, mills, foundries and plants. A few nationally known users are:

Dodge Brothers	American Agricultural Chemical Co.—25 plants
Gillette Safety Razor Co.	Babcock & Wilcox Co.
French, Shriner & Urner	Newberry Cotton Mills
The Millers Milling Co.	Borden Condensed Milk Co.
Aunt Jemima Mills Co.	American Car and Foundry Co.
United Shoe Machinery Co.	



"SELLS" ROLLER BEARING INSTALLED

They fit in practically all existing hangers, post hangers and pillow blocks

"SELLS" ROLLER BEARING BOXES

With Single Roller Structure for Line Shafts and Counter Shafts

Size of shaft, in.	Box dimensions, in.			Price*	Code
	Length	Width	Height		
1 1/16 & 1	6 3/8	2 1/4	2 3/4	\$6.00	Ibex
1 1/8 & 1 1/4	6 1/2	3	3 1/4	7.00	Ice
1 1/4 & 1 1/2	7 1/8	3 1/2	3 1/2	8.00	Idea
1 1/2 & 1 3/4	8	3 3/4	4 1/4	9.50	Idiot
1 3/4 & 2	8 3/4	3 1/2	4 3/4	11.00	Idol
2 1/8 & 2 1/4	9 3/4	4 1/2	5 1/4	13.50	Ignite
2 1/4 & 2 1/2	10 1/4	4 3/4	5 1/2	15.50	Ilk
2 1/2 & 2 3/4	10 3/4	5 1/4	6 1/4	19.00	Image
2 3/4 & 3	11	5 1/2	6 1/2	22.50	Imbibe
3 1/8 & 3 1/4	11 7/8	5 1/2	6 3/4	34.50	Immerse
3 1/4 & 3 1/2	12 3/4	6 1/4	6 3/4	38.50	Impose
3 1/2 & 3 3/4	14 1/4	6 1/4	7 1/4	67.00	Imposter
3 3/4 & 4	15	7 1/4	7 3/4	77.00	Improve
4 1/8 & 4 1/4	15 1/4	7 3/4	8 1/4	88.00	Inapt
4 1/4 & 4 1/2	16 1/4	8	8 1/2	100.00	Inca
4 1/2 & 4 3/4	16 1/2	8 1/2	8 3/4	113.00	Incase
4 3/4 & 5	17	8 1/2	9 1/4	128.00	Income

* Subject to discount.

HEAVY DUTY "SELLS" ROLLER BEARING BOXES

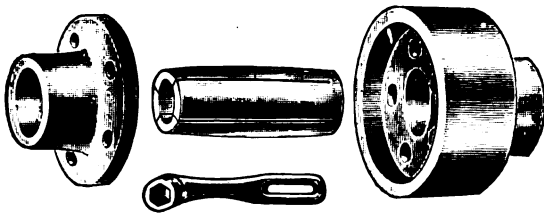
With Double Roller Structures for Main or Jack Shafts and Heavy Belt Pulls

Size of shaft, in.	Box dimensions, in.			Price*	Code
	Length	Width	Height		
1 1/16 & 2	13	3 1/4	4 1/4	\$19.00	Impound
2 1/8 & 2 1/4	13 3/4	4 1/2	5 1/4	23.50	Imprint
2 1/4 & 2 1/2	14 3/4	4 3/4	5 1/2	26.50	Inarch
2 1/2 & 2 3/4	15 1/4	5 1/4	6 1/4	32.50	Inborn
2 3/4 & 3	15 3/4	5 1/2	6 1/2	39.00	Inbred
3 1/8 & 3 1/4	17 1/4	5 1/2	6 3/4	59.00	Inclose
3 1/4 & 3 1/2	17 1/2	6 1/4	6 3/4	66.00	Incog
3 1/2 & 3 3/4	19 3/4	6 1/4	7 1/4	94.00	Indeed
3 3/4 & 4	19 3/4	7 1/4	7 3/4	110.00	Indent
4 1/8 & 4 1/4	21	7 1/4	8 1/4	126.00	Index
4 1/4 & 4 1/2	21 3/4	8	8 1/2	140.00	Indigo
4 1/2 & 4 3/4	22 3/4	8 1/2	8 3/4	161.00	Induce
4 3/4 & 5	24	8 1/2	9 1/4	179.00	Infant
5 1/8 & 5 1/2	24 3/4	9 1/2	10	230.00	Increase
5 1/2 & 6	26 1/2	10 1/4	11 1/4	316.00	Incrout

* Subject to discount.

Standard Compression Couplings

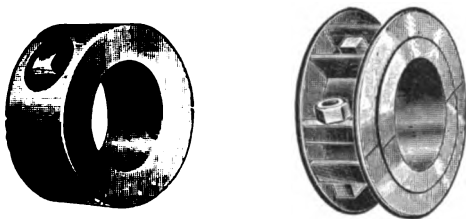
The heaviest and strongest couplings on the market. Perfectly balanced and afford accurate alignment. No projecting parts to catch or tear clothing.



STANDARD COMPRESSION COUPLINGS

Standard Safety Set Collars

These collars are made in solid and split types. They are absolutely safe, the setscrews are sunk—a good safety first feature.



STANDARD SAFETY SET COLLARS

"Rollerine"

"Rollerine" is the ideal lubricant for "Sells" roller bearings, or in fact any bearing. No resin oil, wax, talc, soapstone or gum of any sort is used in compounding it. It will not harden or gum.

"Rollerine" comes in quantities from quart cans to barrels.

A sample can of "Rollerine," that will prove all that has been said, will be sent free to anyone who will write for it.



CAN OF "ROLLERINE"

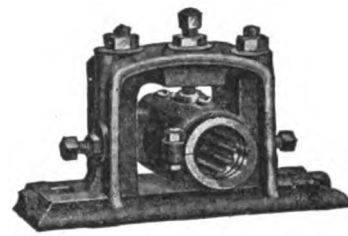
"Sells" Combination Oil and Grease Gun

Affords the best efficient means of applying "Rollerine" to "Sells" roller bearings. It is also adapted for heavy oils and greases of all kinds.

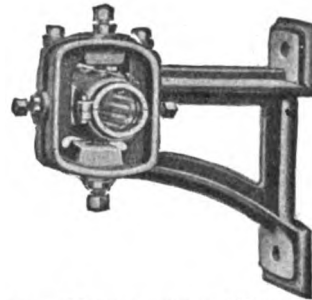
The "Sells" combination oil and grease gun puts the lubricant where it should go.



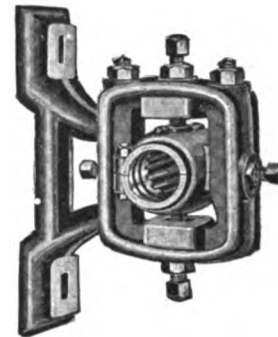
"SELLS" COMBINATION OIL AND GREASE GUN



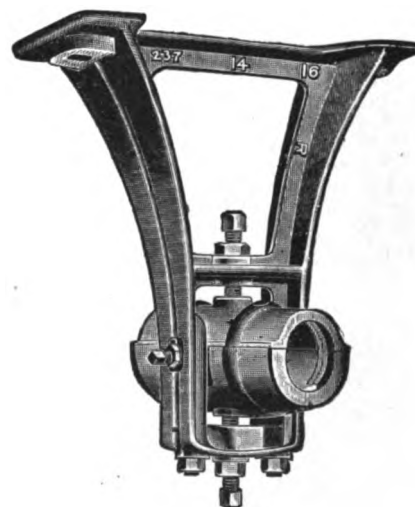
ROYERSFORD PILLOW BLOCK WITH "SELLS" ROLLER OR RING OILING BEARINGS



ROYERSFORD BRACKET HANGER WITH "SELLS" ROLLER OR RING OILING BEARINGS



ROYERSFORD POST HANGER WITH "SELLS" ROLLER OR RING OILING BEARINGS



UNIVERSAL RING OILING HANGER

Catalogue

In addition to the products listed above, a complete line of power transmission machinery is carried by this company.

"Antifriction Power Transmission"—a catalogue with prices will be sent on request.

HYATT ROLLER BEARING CO.

INDUSTRIAL BEARINGS DIVISION

NEW YORK, N. Y.

MOTOR BEARINGS DIVISION, DETROIT, MICH.

TRACTOR BEARINGS DIVISION, CHICAGO, ILL.

PACIFIC COAST DIVISION, SAN FRANCISCO, CAL.

Products

HYATT LINE SHAFT ROLLER BEARINGS.

For Roller Bearings for Cranes, Trolleys and Hoists, see page 795.

Hyatt Line Shaft Roller Bearings

Hyatt line shaft roller bearings are made for all standard sizes of shafting and, being split, can be slipped into position without taking down the shaft or removing pulleys, couplings or hangers.

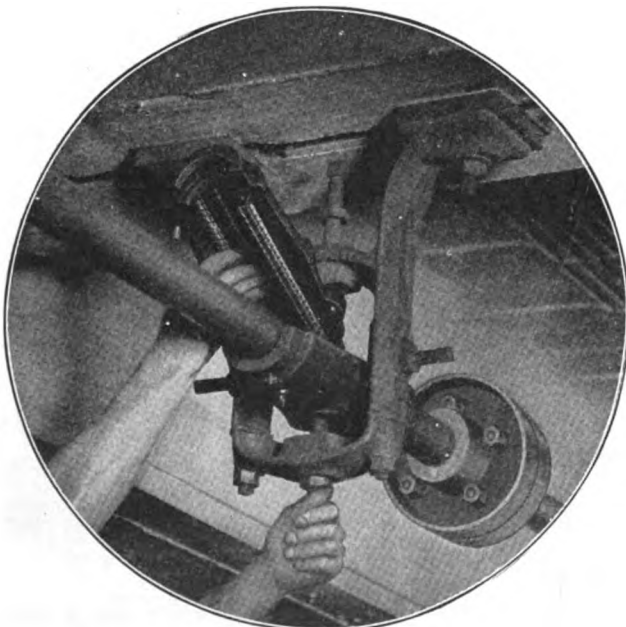
The bearings consist of a series of flexible rollers of chrome-vanadium steel which are retained in position by a substantial steel cage. These are mounted in a cast iron box with steel lining. Being hollow and having helical openings throughout their length, the rollers continually cover all bearing surfaces with oil.

Hyatt roller bearings are sturdily and accurately constructed to give satisfactory service under all conditions.

Hyatt line shaft bearings are made in all shaft diameters from $1\frac{7}{8}$ to $5\frac{1}{8}$ in.

Order these bearings from local transmission machinery dealer or get in touch with us direct.

Ask for Bulletin No. 125.



SHOWING EASE OF INSTALLING HYATT LINE SHAFT ROLLER BEARINGS

Bearing is slipped into position without taking down shaft or removing hangers, couplings or pulleys

Five Reasons Why Line Shaft Hangers Should Be Equipped with Hyatt Roller Bearings

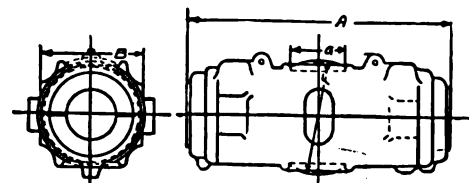
(1) *They save power.* Line shaft friction losses frequently amount to more than 30% of the total power transmitted. Hyatt roller bearings will reduce this at least half, thereby saving 15% of the total power, a worthwhile saving in any plant.

(2) *They save oil.* The rollers of a Hyatt line shaft bearing continually distribute the oil to all the bearing surfaces and the box and hollow rollers afford a space for lubricant that need be replenished only three to four times a year.

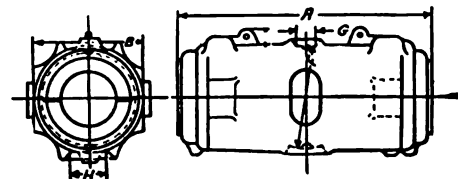
(3) *They are reliable.* Because of elimination of rubbing friction, Hyatt line shaft bearings never run hot, but continue to transmit maximum power for years with no attention for adjustment or replacement.

(4) *They are durable.* The chrome-vanadium steel rollers equally distribute the load and, being tough, operate for years without perceptible wear. Their record is 29 years in some plants.

(5) *They are easy to install.* This type of Hyatt bearing is split to facilitate easy installation without taking down shaft or removing collars, couplings or pulleys.



Ball and Socket (B. & S.) Bearing



Universal Giant Frame (U. G.) Bearing

DIMENSION DIAGRAMS OF HYATT STANDARD ROLLER BEARINGS
Either U. G. or B. & S. bearings may be used in four setscrew hangers

Diam. shaft, in.	Approx. weight, lbs.	A, in.		B, in.		F, in.		G, in.		H, in.
		B. & S.	U. G.	B. & S.	U. G.	B. & S.	U. G.	B. & S.	U. G.	U. G.
1 $\frac{7}{8}$	11	8 $\frac{1}{4}$	8 $\frac{1}{4}$	3 $\frac{5}{8}$	3 $\frac{5}{8}$	3 $\frac{3}{4}$	3 $\frac{3}{4}$	1 $\frac{15}{16}$	1 $\frac{1}{4}$	1 $\frac{11}{16}$
1 $\frac{1}{2}$	14	9 $\frac{1}{4}$	9 $\frac{1}{4}$	3 $\frac{5}{8}$	3 $\frac{5}{8}$	3 $\frac{3}{4}$	4 $\frac{1}{8}$	1 $\frac{11}{16}$	1 $\frac{1}{4}$	1 $\frac{11}{16}$
1 $\frac{1}{4}$	22	10 $\frac{1}{2}$	10 $\frac{1}{2}$	4	4	4 $\frac{1}{2}$	4 $\frac{1}{8}$	2 $\frac{1}{2}$	1 $\frac{3}{4}$	2 $\frac{3}{8}$
1 $\frac{1}{8}$	27	11 $\frac{1}{2}$	11 $\frac{1}{2}$	4 $\frac{1}{4}$	4 $\frac{1}{4}$	4 $\frac{1}{2}$	5	2 $\frac{1}{2}$	1 $\frac{3}{4}$	2 $\frac{3}{8}$
2 $\frac{1}{8}$	38	13	13	5	5	5 $\frac{1}{2}$	5 $\frac{1}{8}$	3	2 $\frac{1}{4}$	2 $\frac{3}{8}$
2 $\frac{1}{4}$	46	14	14	5 $\frac{1}{2}$	5 $\frac{1}{2}$	5 $\frac{1}{2}$	6 $\frac{1}{4}$	3	2 $\frac{1}{4}$	2 $\frac{3}{8}$
2 $\frac{1}{2}$	60	15 $\frac{1}{4}$	15 $\frac{1}{4}$	5 $\frac{3}{4}$	5 $\frac{3}{4}$	5 $\frac{3}{4}$	6 $\frac{1}{2}$	3 $\frac{1}{4}$	2 $\frac{3}{4}$	2 $\frac{3}{8}$
3 $\frac{1}{8}$	67	16 $\frac{1}{2}$	16 $\frac{1}{2}$	6 $\frac{1}{2}$	6 $\frac{1}{2}$	6 $\frac{1}{2}$	6 $\frac{3}{4}$	3 $\frac{1}{2}$	2 $\frac{3}{4}$	2 $\frac{3}{8}$
3 $\frac{1}{4}$	110	17 $\frac{1}{4}$	17 $\frac{1}{4}$	7 $\frac{1}{4}$	7 $\frac{1}{4}$	7 $\frac{1}{4}$	7 $\frac{1}{2}$	3 $\frac{3}{4}$	2 $\frac{3}{4}$	2 $\frac{3}{8}$
3 $\frac{1}{2}$	182	19 $\frac{1}{2}$	19 $\frac{1}{2}$	8 $\frac{1}{4}$	8 $\frac{1}{4}$	10 $\frac{1}{2}$	8 $\frac{1}{2}$	4 $\frac{1}{4}$	2 $\frac{3}{4}$	2 $\frac{3}{8}$
3 $\frac{3}{4}$	230	20 $\frac{1}{2}$	20	8 $\frac{3}{4}$	8 $\frac{3}{4}$	10 $\frac{3}{4}$	9 $\frac{1}{2}$	4 $\frac{1}{2}$	2 $\frac{3}{4}$	3 $\frac{1}{8}$
4 $\frac{1}{8}$	280	22 $\frac{1}{4}$	22 $\frac{1}{4}$	9 $\frac{1}{2}$	8 $\frac{3}{4}$	10 $\frac{3}{4}$	10	5 $\frac{1}{4}$	2 $\frac{3}{4}$	3
4 $\frac{1}{4}$	330	24 $\frac{1}{4}$	24 $\frac{1}{4}$	10	9 $\frac{1}{2}$	10 $\frac{3}{4}$	10	5 $\frac{1}{2}$	2 $\frac{3}{4}$	3
5 $\frac{1}{8}$	380	24 $\frac{1}{2}$	24 $\frac{1}{2}$	10 $\frac{3}{4}$	10 $\frac{3}{4}$	12	12	6 $\frac{1}{4}$	2 $\frac{3}{4}$	3
5 $\frac{1}{4}$	500	30	30	12	12	12 $\frac{1}{2}$	12 $\frac{1}{2}$	6 $\frac{3}{4}$	2 $\frac{3}{4}$	3

AETNA BALL BEARING MFG. CO.

Franklin Street and Institute Place

CHICAGO, ILL.

Products

"Aetna" SINGLE ROW and DOUBLE ROW RADIAL BEARINGS, ANGULAR CONTACT BEARINGS, MAGNETO BEARINGS and BALL THRUST BEARINGS.

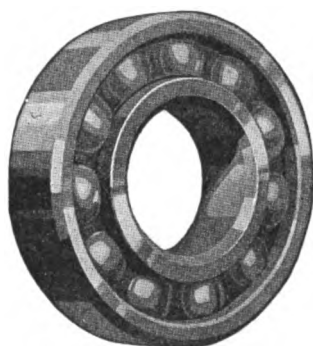
Material

"Aetna" ball bearings of the above types are made of a special chrome alloy electric furnace steel which is submitted to laboratory analysis before fabrication is allowed to proceed. As the heart of a ball bearing lies in the ball itself, only the highest grade of ball is used, much time being spent in securing truth of dimension and fineness of finish necessary to the manufacture of a perfect ball bearing.

As ball bearings of the above types are made to international standards and are interchangeable with bearings of the same type of whatever manufacture, it necessarily devolves on the maker of ball bearings to insistently and persistently inspect the product on its completion for workmanship, accuracy and uniformity.

"Aetna" Single Row Radial Bearings

Designed to carry straight radial loads without any appreciable amount of thrust. These bearings will, however, successfully sustain a thrust load of not more than 10% to 20% of their radial load capacity.

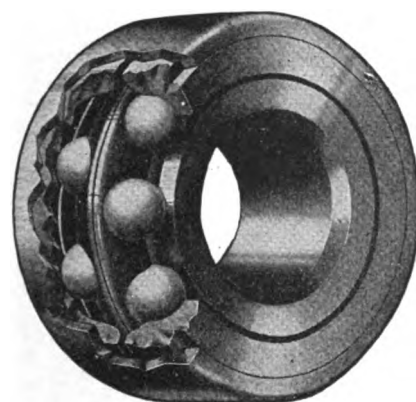


SINGLE ROW RADIAL BEARING

"Aetna" Double Row Radial Bearings

Will take radial loads from one-third to one-half greater than the maximum load capacity of a single row bearings of the same bore and diameter, and will at the same time resist considerable thrust. The amount of thrust this bearing will sustain while carrying radial

loads is determined by the amount of radial load present and vice versa at all times. The combination load capability of the bearing is many times greater than that of a single row bearing. With no other load present, this bearing will sustain thrust loads of nearly twice its radial load capacity.



DOUBLE ROW RADIAL BEARING

"Aetna" Angular Contact Bearings

The angular contact type of bearing is of the cup and cone type with an angular contact on the balls of $11\frac{1}{2}^\circ$ from the normal. The cone, separator, and balls

can be easily withdrawn from the outer race. This bearing owing to its angular load line should be mounted where thrust stresses from one direction only must be provided for together with a greater or less radial load. From the nature of the design the load capacity, either radial or thrust, is dependent on the combination of the two stresses.

"Aetna" Magneto Bearings

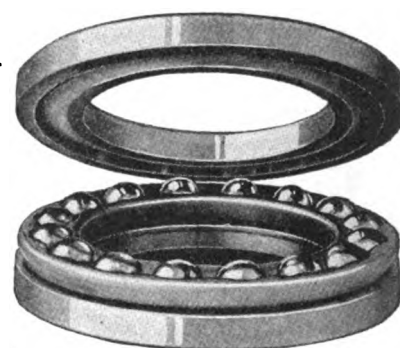
The magneto type of bearing is of the separable type and so designed that the cone and balls may be easily removed from the cup. This facilitates assembling and simplifies construction of magnetos, small electrical motors, starters, fans and like devices. It is used where light loads at high speeds must be taken care of.

"Aetna" Ball Thrust Bearings

There are many types of thrust bearings, such as, plain type—one direction; plain type—two directions; self-aligning—one direction; self-aligning—two directions; self-contained.

The plain type, one direction thrust bearing is used where the thrust is in one direction only.

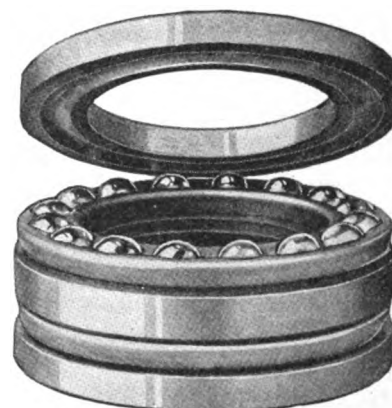
The plain type, two direction bearing is mounted where the



BALL THRUST BEARING
One direction

thrust is from two opposite directions.

Self-aligning thrust bearings are furnished with the lower washer ground to a spherical seat and can be furnished to take care of thrusts, either in one direction or two directions as desired. The spherical seat allows for automatic adjustment of misalignment.



BALL THRUST BEARING
Two directions

Co-operative Service

With a view of assisting any one as to the particular bearing best suitable for his requirements, a fully equipped engineering organization will, without charge, co-operate in designing and recommending the most economical and efficient type of bearing for the installation.

Catalogue

Catalogue covering all regular standard sizes and types of ball bearings, together with load carrying capacities and other valuable engineering data, gladly mailed on request.

THE FAFNIR BEARING COMPANY

Conrad Patent Licensee

Double Ball Bearing Hanger Boxes

NEW BRITAIN, CONN.

BRANCH OFFICES

NEW YORK, N. Y., 5 Columbus Circle
DETROIT, MICH., 752 David Whitney Building

CHICAGO, ILL., 537 South Dearborn Street
CLEVELAND, OHIO, 1016-17 Swetland Building

Products

FAFNIR DOUBLE BALL BEARING HANGER BOXES.
BALL BEARINGS, all standard types and sizes.

Fafnir Double Ball Bearing Hanger Boxes

Fafnir Transmission Ball Bearings eliminate virtually all friction in the transmission of power by shafting. This type of bearing is similar to the radial type, except that the inner ring is much wider. In this way the shaft is afforded extra support, and the bearing may be mounted with a slip fit. A collar, having lugs which engage corresponding slots in the ring, drives the ring and transfers all end thrust to the balls.

The chief application of Fafnir Transmission Bearings is in the Fafnir Double Ball Bearing Hanger Box. The bearings are installed in the ends of this box which is sealed by means of dustproof and oilproof caps held in place by retaining wires. Thus each Fafnir Hanger Box is a unit containing no bolts or screws, or adjustable features. They are shipped completely assembled, and you need only to slide them into the hanger frames and attach the driving collars. We call particular at-

tention to the fact that Fafnir Double Ball Bearing Hanger Boxes are made in various patterns to fit all standard hanger frames.

Other Adaptations of Fafnir Transmission Ball Bearings

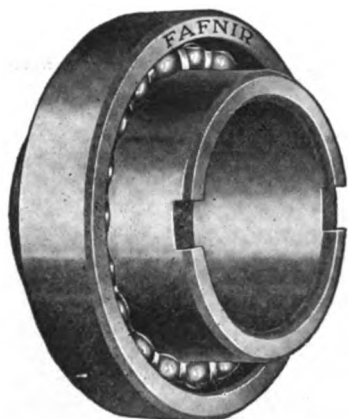
Other adaptations of Fafnir Transmission Ball Bearings include:

- Rigid and self-aligning pillow blocks.
- Blower and fan boxes.
- For clutches and cut-off couplings.
- Loose pulley applications.

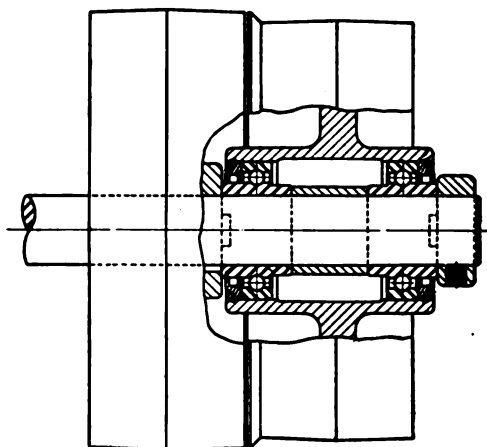
This list might be amplified indefinitely, but we wish to emphasize that in every instance friction is virtually eliminated, resulting in vast power saving; wear and misalignment are done away with; the lubrication problem is greatly simplified; perfect cleanliness is assured; much smoother operation results, and efficiency is correspondingly increased.

Fafnir Ball Bearings for Every Purpose

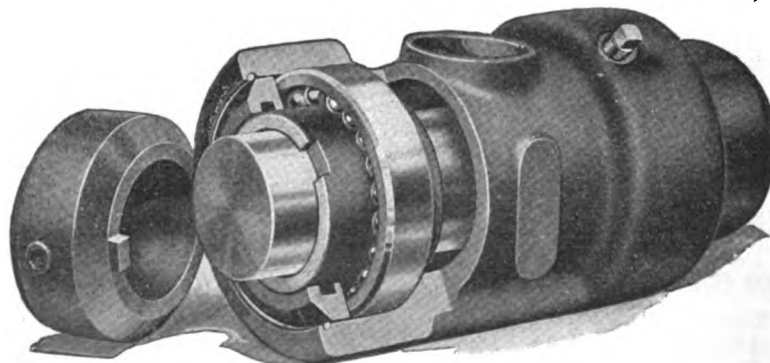
Please write for prices and catalogue.



FAFNIR TRANSMISSION BALL BEARING



APPLICATION OF FAFNIR TRANSMISSION BALL BEARINGS WITH END CAPS AND DRIVING COLLAR, TO TYPICAL LOOSE PULLEY



FAFNIR DOUBLE BALL BEARING HANGER BOX

G-A BALL BEARING MANUFACTURING CO.

TELEPHONE
KEDZIE 8921-8922

3305-3335 West Harrison Street
CHICAGO, ILL.

Product

G-A BALL THRUST BEARINGS.

Material and Sizes

We are manufacturers of all types of thrust ball bearings. The material used is optional as we can furnish a high carbon chrome alloy steel, oil tempered, or a low carbon, case hardened steel. In this way we can meet the financial as well as material requirements of our customers.

The types of bearings shown on this page are representative of the large production type since they are used in machine tools, automobile parts and many other mechanical products. The bearings illustrated, and all other bearings manufactured by us, can be made in either inch or metric standards.

In addition to all of these standardized lines, made both in inch and metric sizes, we will quote prices on and manufacture special sizes and types as well. This is helpful in many cases as it eliminates the changing, on your part, of the old design. In other words we will build the bearing to fit the job, not the job to fit the bearing.

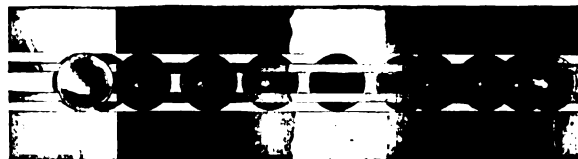
Send inquiries and blue prints. Let us show what we can do in the way of prices and product.

We also manufacture the standard sizes and types of radial ball bearings. These we also make in special sizes when necessary.

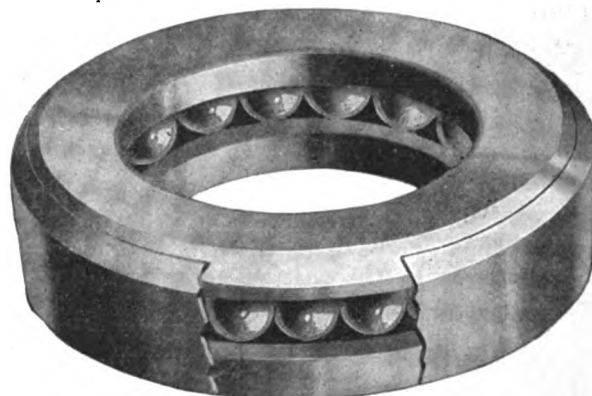
Catalogue and Prices

Catalogue will be mailed on request.

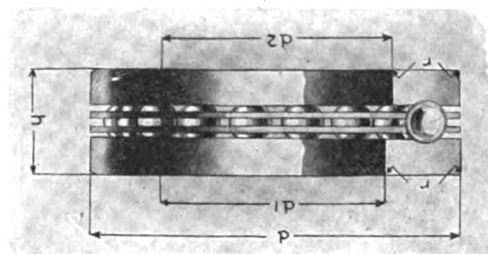
List prices are standard. Discounts are quoted on standard bearings. Net prices are given on special sizes and types.



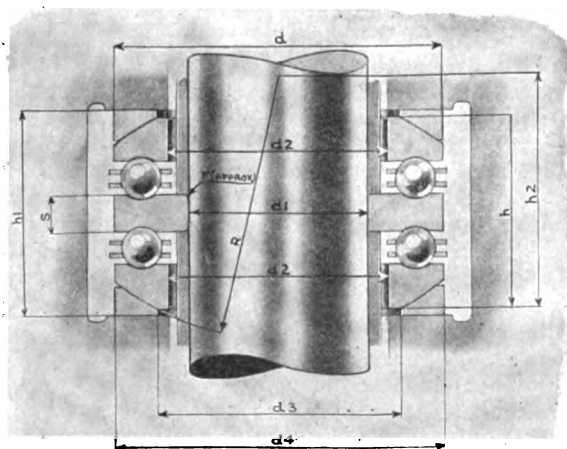
"C" SERIES, FLAT COLLAR TYPE THRUST BEARING
Designed for light loads at slow speeds. Also made in the "D" series for heavier loads



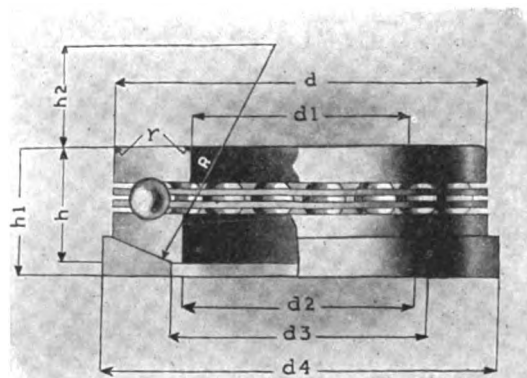
"E" SERIES, SELF-CONTAINED THRUST BEARING
For the same medium load work as the "B" series, adaptable to vertical shafts and open installation



"B" SERIES, GROOVED THRUST BEARING
Used for medium loads at high or low speeds. May be used in most any installation where accuracy is necessary. Dimensions indicated of various sizes given on application



No. 2200-U SERIES, HEAVY TYPE, TWO-DIRECTION, SELF-ALIGNING METRIC STANDARD BEARING
Dimensions indicated of various sizes given on application



No. 1600-F SERIES, MEDIUM TYPE, ONE-DIRECTION, SELF-ALIGNING INCH STANDARD BEARING
Dimensions indicated of various sizes given on application

S K F INDUSTRIES, INC.

Ball Bearings and Like Precision Products

SALES, SERVICE AND RESEARCH DIVISION

165 Broadway

NEW YORK, N. Y.

OFFICES OF DISTRICT REPRESENTATIVES

ATLANTA, GA., 513 Healey Building
BOSTON, MASS., 711 Little Building
BUFFALO, N. Y., Fidelity Trust Building
CHICAGO, ILL., 1314 Marquette Building
CINCINNATI, OHIO, Gwynne Building

SAN FRANCISCO, CAL., 115 New Montgomery Street

CANADIAN S K F COMPANY, LTD.

TORONTO, ONT., 83 King Street, West

CLEVELAND, OHIO, 1036 Guardian Building

DETROIT, MICH., Majestic Building

HARTFORD, CONN., 118 Asylum Street

NEW YORK, N. Y., 165 Broadway

PHILADELPHIA, PA., 1624 Real Estate Trust Building

MONTREAL, QUE., 412 St. James Street

Products

SELF-ALIGNING, RADIAL and THRUST BALL BEARINGS; SELF-ALIGNING BALL BEARING HANGERS and PILLOW BLOCKS; BALL BEARING LOOSE PULLEYS and FRICTION CLUTCHES.

Also manufacturers of Single Row Deep Groove Radial Ball Bearings, Atlas Steel Balls.

Design of Ball Bearings

Self-aligning ball bearings marked S K F are made in all international standard sizes and in the three following types:

(1) Radial bearings, designed for use where the load is carried at right angles to the shaft. (2) Adapter bearings, a modification of the radial bearings, for use where it is not possible to machine the shaft (3) Thrust bearings, which take the load in direction of the axis of the shaft.

Owing to the correct design and extreme care taken in every stage of manufacture of our ball bearings, the following features will be noted, the combination of which are only found in these bearings:

(a) Double row of balls, extra carrying capacity and greater safety.

(b) Self-aligning construction is such that there can be no binding strains in the bearings. Uneven loads, or jolts and shocks of hard service can not cramp or wedge the balls. Both rows of balls carry the load.

(c) Superior workmanship and accuracy. The bearings are as free from friction as it is possible to make them.

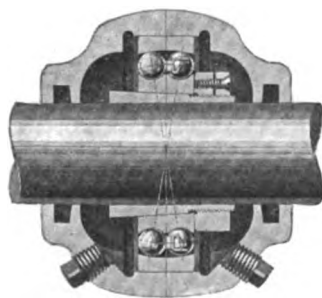
Accuracy and high finish are essential to the successful operation of any bearing. In S K F marked self-aligning ball bearings, these two factors are paramount, and the rigid control and inspection used throughout set a distinct standard in careful manufacture.

Skayef Self-aligning Ball Bearing Construction

The adapter type bearing has a split tapered sleeve



ADAPTER TYPE BALL BEARING USED IN HANGERS

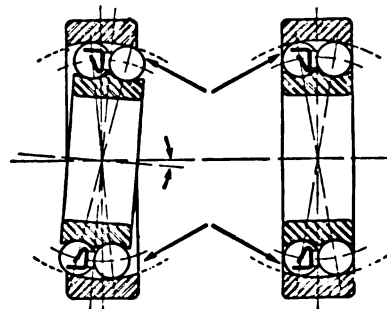


CASING AND BEARING MOUNTED ON SHAFT

known as an adapter. The bearing has a tapered bore and seats on the adapter. In practice, the sleeve is slipped on the shaft, the bearing is placed on it, and by tightening a lock nut on the sleeve the bearing is forced into place and the sleeve is clamped firmly on the shaft.

No moving part touches the shaft. Therefore there can be no wear on the shaft. The bearing and adapter are completely incased in a cast iron housing which is both oiltight and dustproof.

As will be seen from the illustration below, the outer race of the bearing is ground in the form of a sphere whose center is at the center of rotation of the bearing. The inner ball race, together with the double row of balls, is free to rotate within the spherical surface at any angle. This in itself provides the self-aligning feature and entirely eliminates the necessity for a clumsy ball seated or pivoted bearing box. The inner race tilts with the shaft and the bearing can never bind.



HOW THE SELF-ALIGNING BEARING ADAPTS ITSELF TO SHAFT DEFLECTIONS

Skayef Ball Bearing Hanger

Employs the principle of a two-point suspension and carries the S K F marked self-aligning ball bearing in a split housing, which is rigidly held by two threaded suspension rods. This makes a strong compact unit, easy to assemble, locate and inspect. Any necessary adjustment can be easily made at end of housing by means of lock nuts and setscrews provided; this eliminates any possibility of applying pressure which might be transmitted to the bearings while making adjustments. Furthermore, the millwrights are enabled to lay the shaft out on the floor with bearings in plain view, then raise it into position for final adjustment with upper half of housing off, thus assuring absolute correctness of final assembly. The hanger takes care of any possible shaft deflection and enables shaft to turn freely at all times without binding, pinching or rubbing. This assures troubleproof operation with low maintenance costs and in the average plant returns a large item of profit.



SKAYEF BALL BEARING HANGER

Advantages of Self-aligning Bearings

Using Smaller Motors—With S K F marked self-aligning ball bearings the starting friction is no greater than the running friction. This is a very important fact, for, as it is not necessary to provide for heavier starting loads, a much smaller motor may be used. Shafts in cast iron, babbit or bronze bearings frequently become "set" if the shafting equipment is idle for any length of time. The oil is pressed out of these bearings and it is extremely difficult to start the shaft from rest. Again, when bearings are operating at normal speed, rubbing friction is constantly consuming power at a sacrifice of efficiency.

With ball bearings, rolling friction is practically uniform from rest up to very high speed. On this account self-aligning ball bearing hangers start with a minimum effort and operate at all times with the highest possible efficiency.

Where ball bearing hangers are used, the selection of a motor for shop drives reduces itself to the problem of providing alone for normal machine power consumption, without the necessity of providing for the heavy overload capacity usually required to "start up."

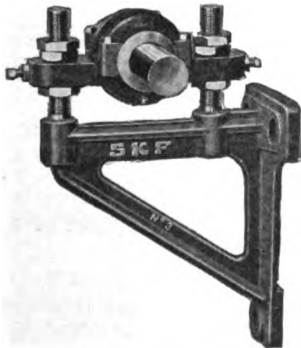
For example: If machines in the shop normally require 250 h.p. to drive and an additional 50 h.p. is consumed by the line shaft in distributing this power, a saving of 50% of the power required for the line shaft will reduce the total power required by 25 h.p. or 8½% of the total. With a motor costing approximately \$9.00 per h.p. there will be an initial saving of approximately \$225.00 in the motor cost.

Other Important Features—Aside from these valuable savings, ball bearing transmission equipment will save from 15% up of the total power cost and 80% of the lubricant needed for plain bearings; 80% in maintenance bills is a conservative estimate of what ball bearings will save on repairs. The oiltight housing insures a clean shop free from dripping oil. Heating is absolutely eliminated and so fires caused by hot bearings can be permanently avoided.

Ball bearing transmission equipment possesses numerous advantages and one or the other of these will always show their superiority. Self-aligning ball bearings save where others waste; they give service where others give trouble. A trial will convince you of their merits better than anything we can say.

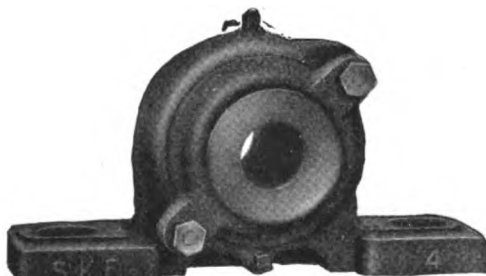
Self-aligning Ball Bearing Hangers and Pillow Blocks

The type of construction employed in the hangers and pillow blocks embodies extreme simplicity with great strength. The ball bearings are contained in accurately machined casings which are securely positioned in the hanger or pedestal pillow block frame by a four-point adjustable suspension. Inasmuch as the ball bearings themselves are self-aligning, no pivoted "cradles" or ball and socket supports are required.

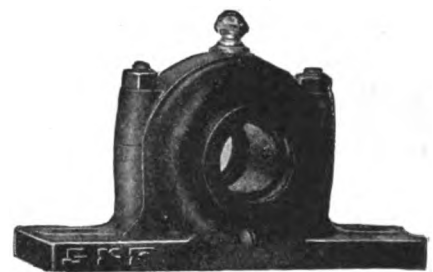


IMPROVED POST HANGER
FRAME

Same adjustments as drop hanger



SELF-ALIGNING BALL BEARING RIGID PILLOW
BLOCK, SOLID TYPE



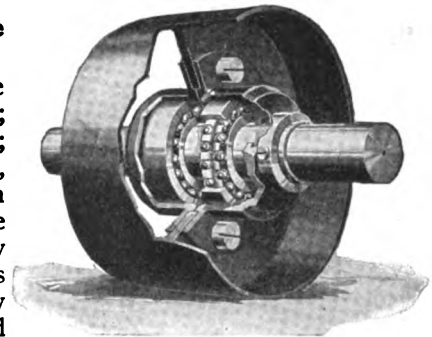
SPLIT TYPE RIGID PILLOW BLOCK
Made in sizes over 3½ in.

The self-aligning feature of ball bearings is of marked value for line shafting. Buildings settle, floors drop and gradually shafting will pull out of line. Misalignment may not be visible to the eye but still be enough to bind the best plain bearing.

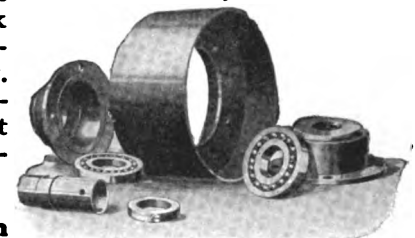
Ball bearings, on the other hand, prevent such binding. They align themselves with the shaft and operate smoothly and efficiently even when the shaft is not in perfect line. Worn bearings, heating and rebabbiting, so often found where plain bearings are used, are entirely absent in a plant using our hangers. The time and expense saved by this feature alone is sufficient to warrant their most careful consideration.

Ball Bearing Loose Pulleys

They eliminate trouble and expense; no dripping of oil; noiseless, dustproof, highly balanced, run at any speed, require lubricating only three or four times a year. Every pulley is tested and filled with lubricant enough to last six months, before leaving the factory. Simple to install—place on the shaft and tighten one set-screw.



Cut-away View

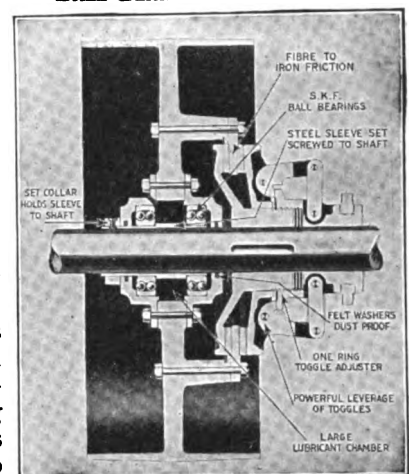


Disassembled
BALL BEARING LOOSE PULLEY

Ball Bearing Friction Clutch Pulleys

Drive buffing lathes, emery and disk grinders, fans, punch presses, etc., direct from the shaft. The ball bearing friction clutch pulley is simple in construction, easy to install, and requires less space on the shaft than ordinary clutches.

Ball bearings are dustproof, and the lubricant chamber needs refilling but two to four times a year according to conditions. Prices on application.



SELF-ALIGNING BALL BEARING
FRICTION CLUTCH PULLEY

THE NORMA COMPANY OF AMERICA

Precision Antifriction Bearings and Precision Measuring Instruments

Anable Avenue
LONG ISLAND CITY, N. Y.

Products

"NORMA" PRECISION BALL BEARINGS; MINIMETER PRECISION MEASURING INSTRUMENTS.

Also manufacturers of Roller Bearings and Thrust Bearings.

"NORMA"
TRADE-MARK

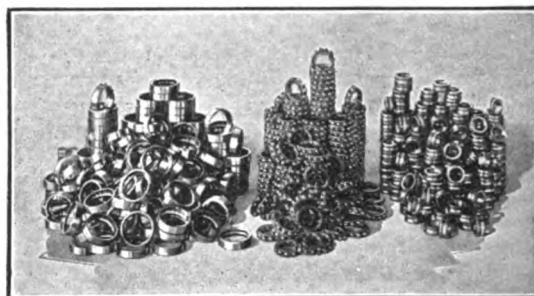


FIG. 3. "NORMA" INTERCHANGEABILITY

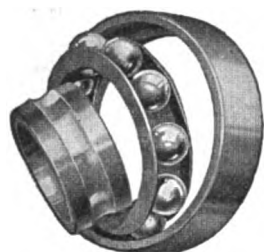


FIG. 1. SEPARABLE FEATURE OF "NORMA" BALL BEARING

These are of the open or separable type, which means that both inner and outer races can be separately and accurately mounted, and the entire bearing opened up for inspection or cleaning without the use of any tools whatever. This is a feature found in no closed or non-separable type of bearing, and it has distinct value—not only in keeping the bearings clean and well lubricated, and therefore in best condition for high duty service, but also in simplifying machining and assembly.

Fig. 1 shows this separable "Norma" feature—and it is to be noted also that each individual ball can be snapped from the cage and as easily replaced. Fig. 2 further illustrates this separable feature, being two "Norma" precision bearings arranged as in the usual style of mounting. The housing or other part carrying the outer race can be removed, bringing the outer race with it and leaving the inner race with cage and balls on the shaft. Cage and balls can then be slipped from the inner race.

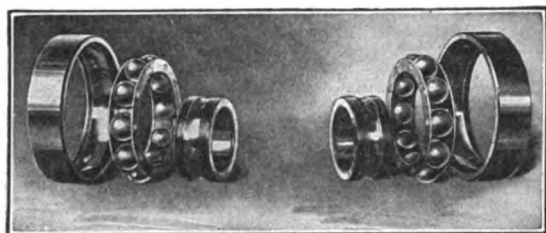


FIG. 2. TWO "NORMA" BALL BEARINGS IN POSITION AS USUALLY MOUNTED

When installing "Norma" bearings both inner and outer races are rigidly mounted; i. e., both races must have a "light tapping fit" or a "light pushing fit by hand," the inner race on the shaft and the outer race in the housing. A looser fit than this is not a rigid mounting; a tighter fit may so distort the races as to take up the extremely small internal tolerances so as to create excessive friction.

"Norma" Interchangeability—This is illustrated in Fig. 3: a pile of "Norma" inner races, a pile of cages with balls, and a pile of outer races, taken at random from stock. Any outer race, any inner race and any cage with balls may be selected and assembled into a perfect "Norma" precision bearing, accurate as to dimensions and alignment, perfect as to true and silent running, as frictionless as a bearing can be made. No other bearing made can be assembled from stock this way, and still be a perfect bearing. No other bearing is interchangeable, part for part.

"Norma" Precision—As indicated by the foregoing, "Norma" bearings are made to higher standards of precision than any other bearings. This explains their extremely smooth, silent, vibrationless running at high speeds. Their freedom from vibration means the reduction of wear to the practical limit.

"Norma" Applications—The proved speed qualities of "Norma" precision bearings have gained for them extensive adoption in the following types of industrial appliances:

Automatic scales	Machine tool accessories
Automobile lighting and starting equipment	Moving picture machines
Cameras	Office appliances
Centrifugal separators	Photographic apparatus
Cloth cutting machines	Phonographs
Dental machinery	Piano motors
Electrical apparatus	Portable wood working machinery
Electric drills	Precision instruments and meters
Electrical equipment	Radio apparatus
Electric fans	Railway signal apparatus
Electric grinders	Signal or wireless apparatus
Electric motors and generators	Small flexible shafts
Electrical utilities	Tachometers
Elevators	Telescope gears
Farm lighting plants	Telephone and telegraph apparatus
Gyroscopic apparatus	Textile machinery
High speed drill presses	Vacuum cleaner equipment
High speed grinders	Washing machines
High speed spindles	Weighing machines
Laundry machines	Winding machines
Magnetos and ignition apparatus	

"Minimeter" Precision Measuring Instrument

This instrument brings to manufacturing on a commercial scale that degree of precision in measurement which otherwise can not be obtained outside the scientific laboratory. It is a device which, measuring to 1/10,000 of an inch, entirely eliminates the personal equation of the operator—the feel, the touch. Its use reduces duplicate part production, interchangeable construction in quantities, to scientific accuracy. Full information will be furnished on request.

Co-operative Service

This company's Engineering Department is at the service of any one interested in the adoption or application of antifriction bearings for any purpose. This service is maintained and freely rendered in the conviction, based on experience and observation, that the selection of the proper type of bearing for a specific duty and its proper mounting, are as important as the quality of the bearing itself, in the effect upon the results accomplished and upon the performance realized.

ALBAUGH-DOVER CO.

Manufacturers of Cut Gears

2100 Marshall Boulevard
CHICAGO, ILL.

Products

CUT GEARS: Spur, Bevel, Miter, Spiral, Helical and Herringbone Gears; Rawhide and Composition Gears and Pinions; Worms, Worm Wheels and Internal Gears; Ratchets; Heavy Duty Hardened Auto Transmission and Tractor Gears; Ignition Gears; Pump Gears; Magneto Gears; Washing Machine Gears; Sprockets.

Member of the American Gear Manufacturers' Association.

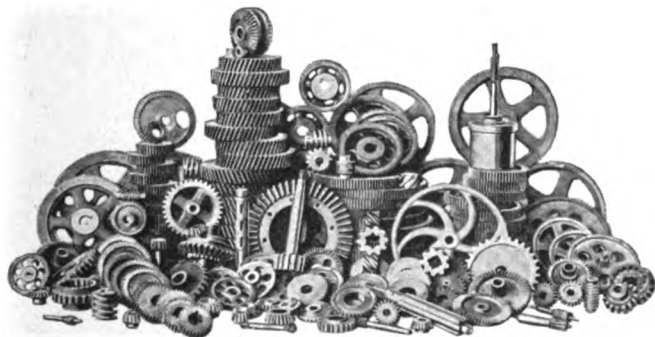
Equipment, Facilities and Co-operative Service

Modern machinery and efficient methods enable this company to manufacture gears in the most perfect manner and with the least possible delay. Bevel gears are generated to the true involute form on either Bilgram or Gleason bevel gear shapers. Transmission gears are generated principally on Fellows shapers. Spur, helical and spiral gears are generated on a large battery of the finest and most modern gear hobbing machines.

The company has also a large number of single cutter gear machines and thread milling machines. The plant, capital and engineering force afford facilities for prompt action on any special requirements. The engineering staff is at the disposal of all parties, and will gladly advise, recommend or furnish estimates upon the receipt of blue prints, sample gears, or specifications.

Cut Gears

Quality of Materials—Gears are made from bar steel, drop forgings, cast steel, semisteel, high grade cast iron, composition, brass or bronze. Quality of materials used is the best available. Customers' material specifications are closely followed.



VARIOUS TYPES OF GEARS



TRANSMISSION GEARS

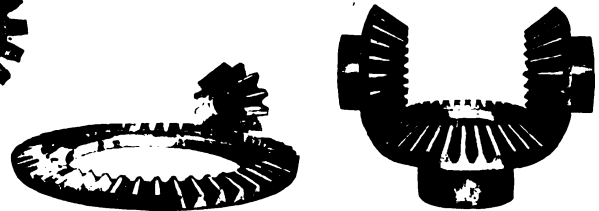


TRADE-MARK



Spur Gears—Cut from the bar, steel forgings, castings, composition, or best grade cast iron, sizes up to 48-in. diameter. Stub tooth gears, particularly for automobile drives, hardened and ground, give greater strength and are more quiet than ordinary spur gears.

Bevel Gears—The superior running qualities of Albaugh-Dover bevel gears are



BEVEL GEARS

well known—hardened and ground gears for tractor, truck and auto drives, transmissions, machine tools, etc., 4 to 1 ratio; diameters up to 20 in.; miter gears up to 16 in.

Spiral Gears—Spiral and helical gears, made from bronze, steel, cast iron or composition, are accurately cut and smooth running; generated to eliminate thick and thin teeth and so as to get perfect involutes.

Supplied in any style for all purposes.



SPIRAL GEARS

Herringbone Gears—Smooth running. Action is continuous, with no shocks when load is transferred from tooth to tooth; wear and objectionable side thrust are practically eliminated.

Manufactured in any metal up to 20-in. diameter.

Rawhide and Composition Gears and Pinions—Especially fitted for high speed service where conditions require absence of noise.

Made with brass or steel flanges reaching to top of teeth, all securely riveted or bolted together, protecting and supporting teeth. In most cases the rawhide of the pinion is made slightly wider than the face of the metal gear, which insures a quiet drive as there is no metallic contact.

Worms and Worm Wheels—Worm gear drives are used where great reduction in velocity or great increase in power is desired. The best combination of materials is used, insuring smoothness of action and long life.

Internal Gears—Manufactured in all pitches up to 4 diametral pitch and 28-in. pitch diameter.

Sprockets—All types of roller and silent chain sprockets made for all purposes, and their quality and workmanship correspond with that shown in all Albaugh-Dover gears.



INTERNAL GEARS

CULLMAN WHEEL COMPANY

Manufacturers of Sprockets

TELEPHONE
LINCOLN 854

1338 Altgeld Street
CHICAGO, ILL.

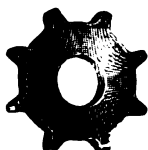
Products

CULLMAN SPROCKETS; CHAINS.

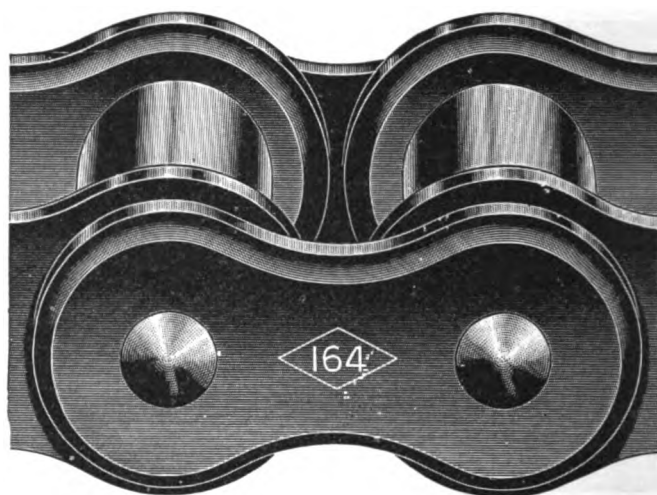
Sprockets and Chains

Specially designed tools and labor saving machinery operated by skilled and experienced men who make only sprockets, enable us to furnish sprockets of the highest quality to the machinery and motor truck manufacturers. Sprockets made for standard block, roller and high speed silent chains, a few types of which are described. Sprockets in stock and made to order.

For the convenience of patrons we carry in stock Diamond, Whitney, Baldwin, Duckworth, and Link-Belt chains—block, roller and high speed silent types.



1-IN. PITCH
BLOCK CHAIN
SPROCKET



NO. 164 DIAMOND CHAIN, FULL SIZE, FITTING 1 3/4-IN. PITCH SPROCKET



1-IN. PITCH, BLOCK CHAIN, FULL SIZE



SPROCKET WITH LARGE SIZE HOLE FOR ROLLER CHAIN

Specifications of Sprockets

Plain steel disk sprockets in stock to fit 1-in. pitch block chain, in widths of $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, and $\frac{1}{2}$ in., rang-



1/2-IN. PITCH, ROLLER CHAIN, FULL SIZE



HIGH SPEED SILENT SPROCKET



HUB SPROCKET

ing from 6 to 50 teeth. Sprockets with hub and larger number of teeth are made to order. Prices on application.

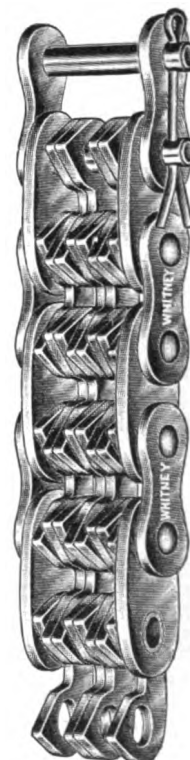
Plain steel disk sprockets in stock to fit roller chains in pitches of $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, $1\frac{3}{4}$, and 2 in., in widths of $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1, and $1\frac{1}{4}$ in., and number of teeth ranging from 6 to 75. Sprockets with hub and larger number of teeth and

of special description are made to order. Prices on application.

Plain steel disk sprockets in stock to fit Whitney high speed silent chains, $\frac{3}{8}$ -in. pitch and $\frac{1}{2}$ -in. pitch, ranging in widths from $\frac{1}{2}$ to $1\frac{1}{2}$ in., and ranging from 15 to 50 teeth.

Sprockets to fit $\frac{3}{8}$ -, $\frac{1}{2}$ -, $\frac{5}{8}$ -, $\frac{3}{4}$ - and 1-in. pitch Whitney silent chain made to order, ranging in widths from $\frac{1}{2}$ to 6 in., in number of teeth up to 132 and in diameter up to 42 in. Made of steel or cast iron. Prices quoted on specifications of requirements.

Catalogue sent on request.



HIGH SPEED
SILENT CHAIN

ROBERT L. LATIMER & CO.

PHILADELPHIA BRANCH OF THE CHAIN BELT COMPANY

Elevating, Conveying and Power Transmission Appliances

24 and 26 North Front Street
PHILADELPHIA, PA.

Products and Services

Manufacturers of and dealers in REX CHAINS; SPROCKET WHEELS; CLUTCHES; GEARS; ELEVATOR BUCKETS; SCREW CONVEYORS; ELEVATOR CASING.

Also a complete line of General Mill Supplies, including Hangers, Pillow Blocks and Rex Traveling Water Screen.

Engineers and manufacturers of general elevating and conveying machinery for handling coal, ashes, stone, sand, gravel, ice and bulk material.

REX CHAIN

TRADE-MARK

Rex Chains

Rex chains as illustrated below, are designed to fill all of the varied needs in conveying and elevating chemicals, coal, ashes, stone, sand, etc.

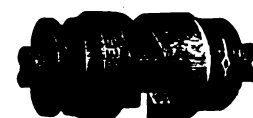
Rex Elevating and Conveying Machinery

Constructed in several standard types.

Long experience and excellent manufacturing facilities insure equipment of approved design and construction at attractive prices.

Information

Prices and further information on our entire line will be promptly furnished on request.



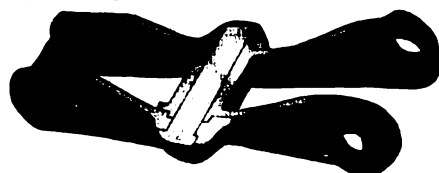
RIGHT-HAND SPIRAL JAW CLUTCH

Made in 3-jaw square clutch type also. Furnished in any desired form



REX DETACHABLE CHAIN

Fills a distinct field where a stronger and more expensive chain would not be permissible. Links changed in a few seconds



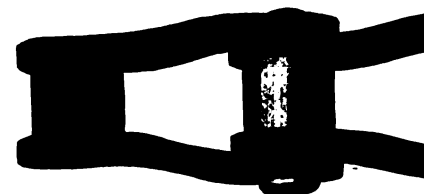
**Cross Section Showing the Griplock Joint
REX GRIPLOCK CHAIN**

For driving and elevating work; especially adapted for heavy service. We can also furnish this chain riveted, pin and cotters or bolted. Some numbers of this chain will run on standard numbers of detachable chain sprocket wheels



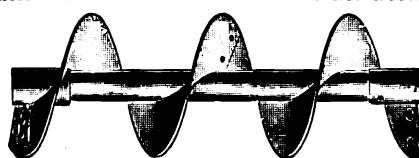
REX COMBINATION CHAIN

Has great strength and wearing qualities. Used in cement mills, fertilizer plants, etc.



REX CHABELCO CHAIN

An all-steel chain which meets the most difficult conditions. Accurate and standard in pitch. All pins and bushings, case hardened. Great strength and wearing qualities



STANDARD STEEL SCREW CONVEYOR

Furnished in standard and special lengths, from 4 to 18 in. in diameter. Also furnished in brass or copper for use in chemical works, tanneries, etc.



**REX MALLEABLE ELEVATOR BUCKET
Style AA**

Heavy reinforced front edges and corners increase life of bucket in handling silicious material, cast in one piece and carefully annealed



REX MITER GEARS

All kinds of spur, bevel, miter and worm gearing



SPROCKET WHEELS

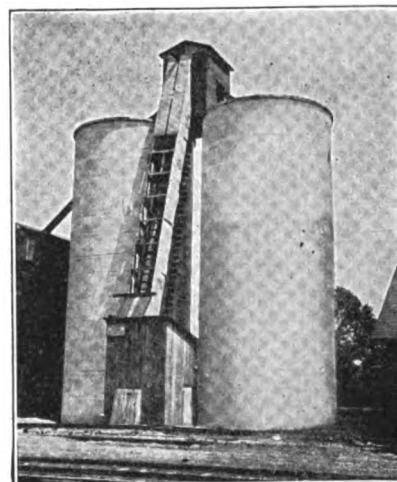
Made of high grade refined iron. Also furnished in semi-steel, cast steel and chilled, in which teeth and rim are tempered to an exceeding hardness, leaving the hub of tough cast iron, easily bored and machined



**SINGLE STRAND
TYPE ELEVATOR**
Also furnished in double strand



**REX STEEL
ELEVATOR CAS-
ING**
Of the most approved design. Furnished in every description



**CONCRETE TANKS AND ELEVATOR FOR
THE STORAGE OF COAL**
Designed and erected by ROBERT L. LATIMER & Co.

THE CINCINNATI RUBBER MFG. CO.

Mechanical Rubber Goods

CINCINNATI, OHIO

BRANCH OFFICES

NEW YORK, N. Y., 19 Spruce Street

CHICAGO, ILL., 180 North Market Street

Products

RUBBER BELTING; HOSE; PACKINGS; TUBINGS; RUBBER COVERED ROLLS; PUMP VALVES; Creamery, Oil Well, Automotive and Moulded RUBBER SPECIALTIES.

Belting

Pacemaker—Friction surface.

Heavy Pacemaker is made of extra heavy, long fibre special woven duck and finest quality high test friction. Especially constructed for unusual conditions and heavy, hard drives.

Light Pacemaker is built of light, hard twisted duck, thoroughly impregnated with friction. Especially adapted to high speed machinery and small pulleys of all kinds.

Elevator Belting—Built to meet the requirements of stamp mills, stone crushers, elevators of all kinds and any special purpose.

Conveyor Belts—Arno and Hontas for carrying coal, coke, or stone, sand, gravel, grain, wood pulp, etc. Withstands tremendous wear. Made with or without reinforced covers for any industry.

Other Types—Also rubber covered belts, stitched oil well belts, hogbeater, and other types of belting.

Hose

Hose is made for all kinds and conditions of service.

Water—*Losant*—Extra heavy, seamless tube and cover. Designed for heavy pressures and maximum durability.

Bolivian—Extra fine tube and heavy duck for unusual conditions.

Delva—Very acceptable hose for conducting purposes or for general all-round service.

Steam—*Losant*—Constructed to meet the exacting test as made by the United States Government for hose in this service.

Arno—An exceptional hose constructed especially for unusually difficult service; reliable in every respect.

Congo—A hose for general purposes, made with oil resisting tube.

Air Tool—*Losant*—Needs no armor because the quality and extra heavy thickness of the cover stock give ample protection against cutting, through constant dragging about over sharp corners and abrasive surfaces.

Arno—Light and flexible and very economical where continuous service is in demand.

Sand Suction—*Sadow*—Cylinder bore throughout with internal diameter to snugly fit over corresponding sizes of standard iron pipe.

Phosphate Suction and Discharge—Extra heavy construction to meet the extreme conditions required in the phosphate mines and other similar services.

Suction—*Broncho*—Made of heavy, close woven duck, either smooth or rough bore for general contractors, mines, etc.

Rotary Oil Drilling—*Losant*—Especially designed for rotary oil well drills. Closely wrapped with heavy wire.

Gasoline—*Puritan*—Resists action of gasoline, naphtha, benzine and petroleum. Heavy duck without wire insertion.



TRADE-MARK

Sand Blast—*Losant*—Designed for service in all sand blast work.

Creamery—*Losant*—Unexcelled for creamery uses; overcomes objectionable features of all other creamery hose types.

Oxy-acetylene—*Losant*—Possesses exceptional wear resisting qualities and insures satisfactory results.

Paper Mill—*Losant*—To meet the conditions in hard service of paper mills. Exceptional tube and heavy wear resisting cover. Made with or without tapered rubber nozzle.

Can Filling—*Losant*—Eliminates wire wrapping. Will not crack or break. Resists the action of brines.

Dredge Sleeves—*Losant*—Made for all kinds and conditions of service.

Sheet Packing

Norka Red Sheet—Impervious to the action of steam, acid, oils and ammonia. The 25 years' successful service and satisfied customers are the best recommendations.

Old Crow—*Oil Proof Black Sheet*—Non-vulcanizing oilproof sheet for high pressure. Will not harden, crack or burn out.

High Pressure Fibre Sheet Packing—*Wampus*—Graphited throughout. Especially adapted for flange joints, ammonia, oil, and superheated or saturated steam.

Sadow—Same construction as *Wampus*, not graphited.

Square Hydraulic—*Puritan*—Exceptionally satisfactory under most trying conditions of service.

Spiral Packing—*Old Crow Square*—Best quality duck and rubber friction, cover thoroughly impregnated with mineral and animal oils, heavily graphited.

Asbestos—In sheets, spiral, valve stem, and all other types.

Tubing

Special, such as milking machine, air pumps; special and commercial grades of red, white and black tubings supplied to specifications if desired.

Creamery Specialties

Including separator rings, milking machine tubing, valve rubbers, bottle fillers, etc.

Oil Well Specialties

Including belting, hose, packing, stuffing box rings, swab rubbers, etc.

Automotive Specialties

Including radiator hose, and all other types of automotive rubber articles.

Pump Valves

For hot and cold water and varied kinds and conditions of service.

Rubber Covered Rolls

For paper mills and all other services in which rubber covered rolls are used. Satisfied customers are our best reference.

THE B. F. GOODRICH RUBBER COMPANY

Mechanical Rubber Goods

AKRON, OHIO

BRANCHES IN ALL INDUSTRIAL CENTERS

Products

TRANSMISSION, CONVEYOR and ELEVATOR BELTING.

PACKING and PUMP VALVES for all manner of service.

RUBBER HOSE for all purposes.

RUBBER COVERED ROLLS.

Manufacturing and Distributing Facilities

Goodrich manufactures every item of mechanical rubber goods for which there is call from industry, and to the highest standard of quality. It has served industry continuously since 1870. Not only has Goodrich immense manufacturing facilities, but a network of branches in all important industrial centers and able representatives to give advice and service. The INTERNATIONAL B. F. GOODRICH COMPANY is organized to take care of foreign demand.

Belting

The Goodrich line is complete in this respect; a type of belt for every transmission, conveying and elevating requirement and condition. Leaders in the Goodrich belt group are:

Goodrich "Commander"—A friction surfaced belt for heavy duty service in steel, paper, lumber and cotton mills; factories, mines, mills and on oil well power installations. It has demonstrated conclusively its power



GOODRICH "COMMANDER"

conserving abilities. In addition to perfect balance of rubber and duck for maximum strength, durability and flexibility, the belt possesses a special gum cushion to protect it from severe shocks and strains and the inner plies against moisture.

For high speeds over small pulleys we recommend "Marathon" the quality companion of "Commander."

"Longlife" Conveyor Belt—Here is a conveyor belt so perfectly balanced in construction it troughs



"LONGLIFE" CONVEYOR BELT

of its own weight. Rests naturally on the idlers. Runs straight. Edges protected by carrying the top-quality, durable cover over them, and anchoring it in the back. "Longlife" belt holds what is reputed to be the world's record for

tonnage conveying—7,313,400 tons of tailings from a Utah copper ore mill. A belt of unusual merit.

"Maxecon" Conveyor Belt—Another Goodrich belt of top-quality, widely used in the carrying of coal and coke.

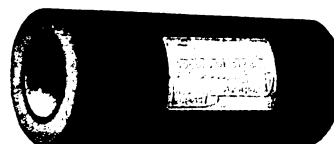
The Goodrich Company has unequalled facilities for producing in short order, belts for special or unusual conditions.



Hose

Goodrich manufactures a complete line of hose for conducting air, acid, chemicals, gas, oil, water and steam. A correct and economical style can be found for every service requirement.

"Commander" Pneumatic Hose—Here is an exceptional value. By a special process, Goodrich has found a means of building into the cover of this hose, durability and cushioning powers so pronounced that the cover can not be whittled with a knife—an unusual feature. Naturally, it is wonderfully equipped to defy the abrasion met in air tool service. Inner tube easily resists oil action.



"GOODRICH" STEAM HOSE

Inner tube easily resists oil action.

Packing and Valves

In the Goodrich list of packings and pump valves can be found a type to meet precisely any service condition. All packings have been tested thoroughly, and show a substantial margin of safety.

A conspicuous value in the Goodrich packing group is "Superheat" sheet packing for superheated steam, high pressure air, acid and chemical lines. It is composed of long fiber asbestos and heat resisting materials pressed into a strong, resilient sheet. It will not crack, burn or dry out when exposed to high steam temperatures. It holds easily the superheated steam pressures met in normal service, and still has a big margin to spare. Very popular in all industries.

In addition to the flexibility and quality of the Goodrich packing and valve line, there is at your disposal, without obligation, an engineering service to lend aid in selecting the proper grade or type for any service condition.



SUPERHEAT PACKING

Rubber Covered Rolls

Goodrich has been a pioneer in the development and perfection of rubber covered rolls for a wide field of service. Whatever the requirement or the problem, Goodrich is amply and ably equipped to meet it.



RUBBER COVERED ROLL

Other Products

The above can but sketch briefly the range of Goodrich manufacture. Our miscellaneous moulded rubber specialties alone number more than 30,000.

We also make, among other things, a full line of rubber footwear, rubber matting, and moulded and hard rubber goods.

THE BRISTOL COMPANY

Manufacturers of Belt Fasteners and Safety Setscrews
WATERBURY, CONN.

BRANCH OFFICES

BOSTON, MASS., Old South Building
PITTSBURGH, PA., Frick Building
CHICAGO, ILL., Monadnock Building

SAN FRANCISCO, CAL., Rialto Building

NEW YORK, N. Y., 114 Liberty Street
DETROIT, MICH., Book Building
ST. LOUIS, MO., Boatmen's Bank Building

Products

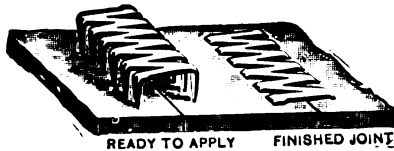
BRISTOL'S PATENT STEEL BELT LACING, BELT PLATES, BELT RIVETS and SAFETY SETSCREWS.

For Bristol's Recording Instruments, see pages 586-587.

Bristol's Patent Steel Belt Lacing

Quickly and easily applied. Guarantees repairs to broken belts in the shortest possible time. No special tools required; all that is needed is a hammer, a block of soft wood and one's hands.

For all kinds of belts from the lightest split leather to the extra heavy conveyor belts.



NO. 1 STYLE, BRISTOL'S PATENT STEEL BELT LACING

Packed in assorted widths, or furnished packed all one width. Each box contains enough to lace 100 in. in width of belt. Saves time and can be applied quickly without special tools.

No. 00, for belts from $\frac{1}{8}$ to $\frac{1}{4}$ in. thick, \$2.50 per box. No. 0, for belts from $\frac{1}{4}$ to $\frac{3}{8}$ in. thick, \$1.00 per box.
No. 1, for belts from $\frac{3}{8}$ to $\frac{1}{2}$ in. thick, \$2.50 per box.
No. 2, for belts from $\frac{1}{2}$ to $\frac{5}{8}$ in. thick, \$2.00 per box.
No. 3, for belts from $\frac{5}{8}$ to $\frac{3}{4}$ in. thick, \$2.50 per box.
No. 4, for belts from $\frac{3}{4}$ to $\frac{7}{8}$ in. thick, \$3.00 per box.
No. 5, for belts from $\frac{7}{8}$ to 1 in. thick, \$3.50 per box.



NO. 11 STYLE, BRISTOL'S PATENT STEEL BELT LACING, FOR RUBBER AND COTTON BELTS

No. 100, for belts from $\frac{1}{8}$ to $\frac{1}{4}$ in. thick, \$2.50 per box.
No. 10, for belts from $\frac{1}{4}$ to $\frac{3}{8}$ in. thick, \$2.50 per box.
No. 11, for belts from $\frac{3}{8}$ to $\frac{1}{2}$ in. thick, \$1.50 per box.
No. 12, for belts from $\frac{1}{2}$ to $\frac{5}{8}$ in. thick, \$2.00 per box.
No. 13, for belts from $\frac{5}{8}$ to $\frac{3}{4}$ in. thick, \$2.50 per box.
No. 14, for belts from $\frac{3}{4}$ to $\frac{7}{8}$ in. thick, \$3.00 per box.
No. 15, for belts from $\frac{7}{8}$ to 1 in. thick, \$3.50 per box.
No. 17, for belts from $\frac{1}{8}$ to $\frac{1}{4}$ in. thick, \$4.95 per box.
No. 19, for belts from $\frac{1}{4}$ to $\frac{3}{8}$ in. thick, \$6.05 per box.



STAGGERED POINT STYLE, BRISTOL'S PATENT STEEL BELT LACING, FOR ALL KINDS OF BELTS

No. 1100, for belts from $\frac{1}{8}$ to $\frac{1}{4}$ in. thick, \$2.50 per box.
No. 110, for belts from $\frac{1}{4}$ to $\frac{3}{8}$ in. thick, \$2.50 per box.
No. 110½, for belts from $\frac{3}{8}$ to $\frac{1}{2}$ in. thick, \$1.25 per box.
No. 111, for belts from $\frac{1}{2}$ to $\frac{5}{8}$ in. thick, \$1.50 per box.
No. 112, for belts from $\frac{5}{8}$ to $\frac{3}{4}$ in. thick, \$2.00 per box.
No. 113, for belts from $\frac{3}{4}$ to $\frac{7}{8}$ in. thick, \$2.50 per box.
No. 114, for belts from $\frac{7}{8}$ to 1 in. thick, \$3.00 per box.
No. 115, for belts from $\frac{1}{8}$ to $\frac{1}{4}$ in. thick, \$3.50 per box.
No. 117, for belts from $\frac{1}{4}$ to $\frac{3}{8}$ in. thick, \$4.95 per box.
No. 119, for belts from $\frac{3}{8}$ to $\frac{1}{2}$ in. thick, \$6.05 per box.

Bristol's Patented Steel Belt Plates and Rivets

May be used on rubber and cotton belts. Bristol's rivets are furnished with improved sharpened points,

TRADE MARK
BRISTOL'S
REG. U. S. PAT. OFFICE

and when applied, will roll back and grasp around the fibers without cutting them. Made in a complete line of styles and sizes.



BRISTOL PATENT BELT PLATE

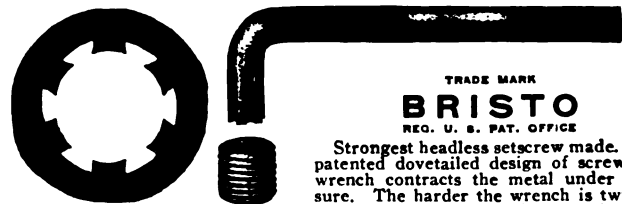
Size No.	List price, per gross	Size No.	List price, per gross	Size No.	List price, per gross
700	\$1.44	720	\$4.32	730	\$ 8.64
710	1.44	721	4.32	731	11.52
711	2.88	722	5.76	732	12.96
712	4.32	723	7.20	733	14.40
713	5.76	724	8.64	736	Assorted
714	5.76	726	Assorted	740	14.40
716	Assorted			741	17.28



BIFURCATED BELT RIVETS

No. 809 With Small Shank		No. 810 With Large Shank		No. 811 With Extra Large Shank	
Length, in.	Per gross	Length, in.	Per gross	Length, in.	Per gross
$\frac{1}{8}$	\$0.40	$\frac{1}{8}$	\$0.60	$\frac{1}{8}$	\$0.80
$\frac{3}{8}$	.40	$\frac{3}{8}$	.60	$\frac{3}{8}$	.80
$\frac{1}{2}$	.40	$\frac{1}{2}$	.60	$\frac{1}{2}$	.96
$\frac{5}{8}$	.40	$\frac{5}{8}$	.60	$\frac{5}{8}$	.96
$\frac{3}{4}$	.45	$\frac{3}{4}$	.68	$\frac{3}{4}$	1.10
$\frac{7}{8}$	.45	$\frac{7}{8}$	.75	$\frac{7}{8}$	1.10
		1 1/8	.75	1 1/8	1.20
		1 1/4	.75	1 1/4	1.20
		1 3/8	.85	1 3/8	1.32
		1 1/2	.85	1 1/2	1.32
				1 3/4	1.32
				1 7/8	1.32

"Bristo" Patented Safety Setscrew



Showing Dovetail Design

TRADE MARK
BRISTO
REG. U. S. PAT. OFFICE

Strongest headless setscrew made. The patented dovetailed design of screw and wrench contracts the metal under pressure. The harder the wrench is twisted, the more the metal of screw is compressed. Setscrews with special points or special lengths furnished to order.

"BRISTO" SAFETY SETSCREW



FIG. 13828B

No.	Diam., in.	Length, in.	U. S. standard threads per in.	Price 100 screws and 8 wrenches
50	$\frac{1}{8}$	$\frac{1}{8}$	18	\$ 5.00
60	$\frac{3}{8}$	$\frac{1}{8}$	16	5.00
70	$\frac{1}{2}$	$\frac{1}{8}$	14	6.00
80	$\frac{5}{8}$	$\frac{1}{8}$	13	7.00
90	$\frac{3}{4}$	$\frac{1}{8}$	12	8.00
100	$\frac{7}{8}$	$\frac{1}{8}$	11	10.00
120	$\frac{1}{2}$	$\frac{1}{8}$	10	12.00
140	$\frac{3}{4}$	$\frac{1}{8}$	9	15.00
160	1	$\frac{1}{8}$	8	20.00

In ordering, specify quantity, number and length.

DETROIT BELT LACER COMPANY

Manufacturers of Belt Lacing and Lacers

DETROIT, MICH.

CANADIAN REPRESENTATIVE: BULL DOG LACER COMPANY OF CANADA, HAMILTON, ONT.

Products

BELT LACING, BELT LACERS.

Detroit Belt Lacing

Machine closed wire hook lacing is considered the easiest to apply, most efficient and economical belt lacing obtainable. No other type of lacing approaches its percentage of belt strength developed and smoothness of operation under all conditions.

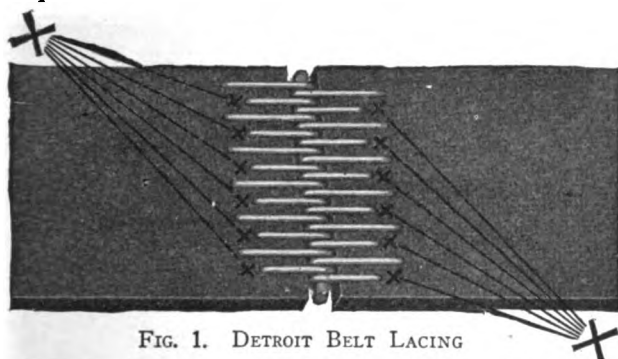


FIG. 1. DETROIT BELT LACING

Note that there are no perforations on either side of the belt at points marked X. It is not possible to leave the belt as strong by any other method.

"Detroit" belt lacing is the only machine closed wire lacing that gives a perfect *staggered* grip on the belt. This is done by alternating long and short hooks. Shows 50% less reduction of area on any cross section for equal wire strength. Pulling strength of each Detroit hook over 100 lbs. This is the result of the holes being perfectly staggered and the high quality of the steel wire used.

Detroit hooks are put up in 12-in. sections, this length having been proved to cut to best advantages for all widths of belts. Hooks are secured to paper side strips to facilitate shipment and handling.

Detroit Belt Lacers

For applying belt lacing.

Vise Tool—Used in an ordinary vise. Has enough spring to hold itself perfectly in place in the vise, and insures uniform work at all times. Very handy and popular. Suitable for small plants or individual tool chests.

Regular Tool—For industrial plant and factory use. Unexcelled in speed, ease of operation and quality of work done. Has two handles, either of which operates the lacer, leaving one hand free to hold the belt. Has a removable magazine which facilitates application of lacing. This is a very convenient feature and is used exclusively in the Detroit lacer.

Every Detroit lacer is fully guaranteed.



FIG. 3. DETROIT LACER—REGULAR TOOL

Prices of Detroit Lacers and Lacing

BELT LACERS		
Vise Tool (Fig. 2)		\$ 5.00
Regular Tool (Fig. 3)		25.00
LACING (INCLUDING RAWHIDE PINS)		
	Service	Per box of 12 12-in. strips
No. 2	For light single belts	\$1.00
No. 3	For single belts	1.25
No. 4	For heavy single belts	1.25
No. 5	For double belts	1.50
No. 6	For heavy double belts	1.75
EXTRA RAWHIDE PINS, 12-INCH LENGTH		
	Diameter, in.	Per bundle of 24 pins
No. 2	$\frac{3}{32}$	\$0.70
No. 3	$\frac{3}{32}$	.70
No. 4	$\frac{5}{32}$	.70
No. 5	$\frac{7}{32}$	.80
No. 6	$\frac{9}{32}$	.90

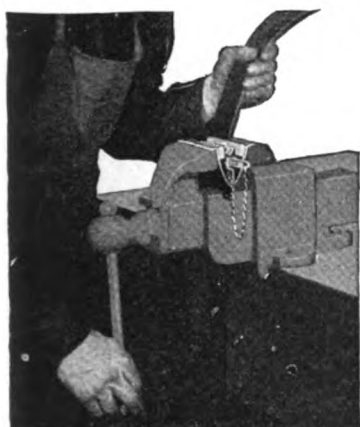


FIG. 2. DETROIT LACER—VISE TOOL



FIG. 4. 12-INCH SECTION OF DETROIT HOOKS WITH SIDE STRIP PARTLY PULLED OFF

ALLIS-CHALMERS MANUFACTURING COMPANY

Power and Electrical Equipment
MILWAUKEE, WIS.

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Products

ELECTRICAL EQUIPMENT: Motors for all purposes, Alternating Current and Direct Current Generators, Motor Generator Sets, Transformers, Synchronous Converters, Frequency Changers, Balancers, Boosters, Synchronous Condensers, Switchboards.

POWER EQUIPMENT: Steam Turbines; Steam Gas and Oil Engines; Hydraulic Turbines; Electric Power Units with any type of prime mover.

INDUSTRIAL MACHINERY: Portable and Stationary Air Compressors, Crushing and Cement Machinery, Mining Machinery, Power Transmission Machinery, Flour Mill Machinery, Saw Mill Machinery, Timber Treating and Preserving Machinery, Pumping Engines, Steam and Electric Hoists, Farm Tractors, etc.

For Centrifugal Pumps, see page 614.



TRADE-MARK

commutating poles insuring sparkless commutation, dustproof bearings, thorough ventilation, windings treated to resist oil and moisture. Larger ratings built in the pedestal bearing type.

Alternating and Direct Current Generators

Allis-Chalmers generators are built in the belted type or direct connected type for engine, steam turbine, or waterwheel drive, both horizontal and vertical for the latter drive. Ratings and speeds are adapted to the various types of prime movers. Complete units can be furnished with any type of prime mover, thereby giving purchaser undivided responsibility.



2000 Kw. DIRECT CURRENT ENGINE DRIVEN UNIT

Polyphase Induction Motors

Made in standard ratings and speeds in both squirrel cage and slip ring types for belt drive or direct connection. They are of very rugged construction and therefore adapted to severe service conditions. Shafts are large and rigid while the bearings are liberal in size. Moistureproof coils are used.

Slip ring motors are for use where the starting conditions are severe and starting current must be kept low, and for varying speed requirements.



SQUIRREL CAGE INDUCTION MOTOR

Synchronous or Rotary Converters

Standard synchronous converters or "rotaries" for industrial or mining service deliver 250 or 275 volts direct current when operating from the alternating current supply system. They are built for ratings of 100 kw. and larger, in the commutating pole type, and for 60-cycle and 25-cycle systems.

Railway "rotaries" are supplied for voltages up to 1500 volts direct current.



200 Kw. INDUSTRIAL SYNCHRONOUS CONVERTER

Synchronous Motors and Condensers

Synchronous motors are especially suited for driving generators, large air compressors, pumps, line shafts and other constant speed apparatus where the starting conditions are not severe. The corrective effect which they exert on the power system makes them particularly desirable for alternating systems where the power factor is low. Built for ratings of 50 h.p. and larger.

Direct Current Motors

Type "E" motors are made in ratings and speeds corresponding to those of constant speed induction motors, as well as adjustable speed ratings, in capacities up to 200 h.p. They are of rugged construction with



DIRECT CURRENT MOTOR, TYPE "E"

Motor Generator Sets

For transforming from alternating to direct current, standard sets are built for ratings of 2 kw. and larger. Ratings of 50 kw. and larger may be provided with synchronous motors suitable not only for driving the direct current generator, but for correcting the power factor of the alternating current system.

Sets operating from direct to alternating current, frequency changing sets, balancers, boosters and many other sets are built for particular service conditions.

Some of the largest sets in service are those built by the ALLIS-CHALMERS MANUFACTURING COMPANY.



1500 Kw. MOTOR GENERATOR SET

Transformers

Distribution transformers are built for high and low tension power or lighting distribution. Standard ratings, up to 200 kv-a. are furnished in all commercial voltages.

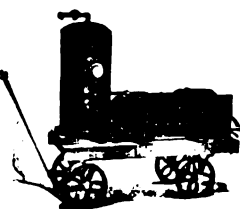
Allis-Chalmers power transformers are built for voltages up to the highest in transmission service, and are used on many of the largest transmission and distribution systems of the country. Information furnished on application.



1250 Kv-A RADIATOR
TYPE TRANSFORMER

Air Compressors

These compressors are extensively used for garage or industrial purposes. They are entirely automatic in operation, maintaining the air pressure practically constant at all times. Portable or stationary equipment are built in capacities from 11 to 150 cu. ft. for belt drive or in the motor driven type.

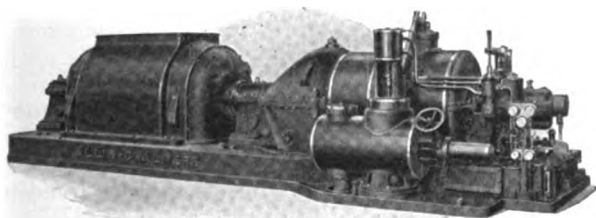


PORTABLE AIR COM-
PRESSOR

Steam Turbines

Allis-Chalmers steam turbine and alternator units, condensing, non-condensing, mixed pressure and low pressure types, built in sizes from 200 kw. up.

Allis-Chalmers steam turbines are of the horizontal reaction type, highly efficient, simple in design, accessible for inspection and built for continuous service.

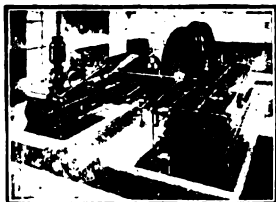


4000 Kw. 3600 R. P. M. TURBO-ALTERNATOR UNIT

Corliss Engines

The Corliss Engine is the most reliable and efficient of reciprocating engines.

Our full line of engines and 50 years experience enable us to furnish an engine best suited to meet all conditions.



CROSS-COMPOUND CORLISS
ENGINE WITH DIRECT
CONNECTED GENERATOR

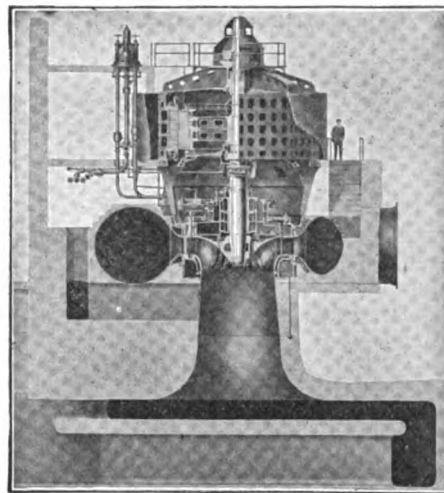
Condensers

These are built in the surface, jet and barometric types and include a complete line of condenser auxiliaries.

Hydraulic Turbines

ALLIS-CHALMERS MANUFACTURING COMPANY is the only manufacturer in the world building complete hydro-electric units and having an organization experi-

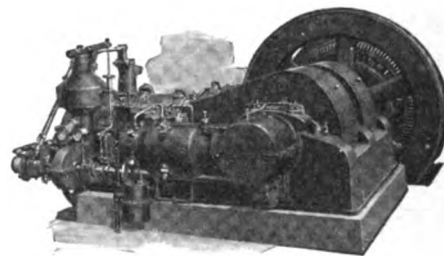
enced in furnishing such equipment for all heads and capacities. Designs comprise units suitable for heads from 2 to 5000 ft. and from 1 to 100,000 h.p.



37,500 H.P. 32,500 Kv-A HYDRO-ELECTRIC UNIT, BUILT FOR
NIAGARA FALLS POWER CO.

Diesel Engines

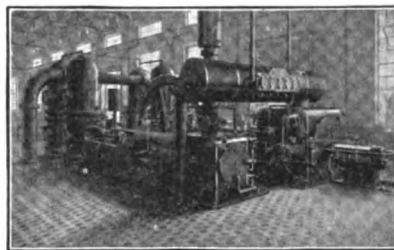
The Allis-Chalmers oil engine combines all the economical advantages of the Diesel system, together with special constructive features essential for reliability in service. The engine is of the four-stroke cycle horizontal type with an open fuel nozzle and a low pressure starting system.



DIESEL ENGINE

Pumping Engines

The opposed type of high duty crank and flywheel pumping engine, as built by ALLIS-CHALMERS MANUFACTURING COMPANY, is the result of 40 years of successful experience in designing and building pumping engines. Pumps of this type are built in sizes varying in capacity from 1 to 25 million gals. per day and are used where high economy and absolute reliability are desired.



1,200,000-GALLON PUMPING ENGINE

Allis-Chalmers designs also include the following types of plunger pumps: vertical, triple expansion pumping engines, vertical, compound pumping engines, horizontal steam driven hydraulic pressure pumps, horizontal steam driven oil line pumps, motor driven direct connected mine pumps, motor driven direct connected hydraulic pressure pumps, motor driven, geared hydraulic pressure pumps, motor driven geared oil pumps.

ENGBERG'S ELECTRIC & MECHANICAL WORKS

Manufacturers of Engines, Dynamos, Generating Sets

21 Vine Street

ST. JOSEPH, MICH.

Products

ENGBERG ENGINES, GENERATORS and DIRECT CURRENT GENERATING SETS.

Also manufacturers of Motors.

Standards of Design

The design of Engberg engines and generators are the result of 20 years' experience in perfecting and producing the most reliable, and at the same time the most efficient, generating sets obtainable.

For dependability, economy in steam and oil, and low cost of maintenance, Engberg direct current generating sets are a most remarkable piece of equipment.

The workmanship and materials can not be excelled. We invite careful inspection and investigation because the general principles, as well as the smallest details, have never failed to attract the attention of the most critical buyer.

Engines

Guarantee—Engberg engines are guaranteed to be free from defective workmanship, material and design, and to do the work they are intended for. We will repair or replace, without cost to the purchaser, any part or parts of engines which shall prove defective within one year from date of shipment, while operating under normal conditions and under proper supervision and attendance.

Range—The engines are manufactured from $3\frac{1}{2} \times 3\frac{1}{2}$ in. to 12×10 in., with either the automatic or throttle governor, and on request, specially equipped for direct connect on or belt drive, and for all lines of service where a vertical, self-oiling automatic engine is adaptable.

Construction—Simplicity combined with dependability and successful performance has been our aim in producing Engberg engines. Accessibility and ease of adjusting all working parts are distinctive. The principal features in construction and design follow:

Connecting Rod—This is undoubtedly the heaviest and most substantial rod used on this type of engine. It is made of special connecting rod steel and on all engines up to and including frame D, the rod is drop forged, while on the larger sizes it is of cast steel.

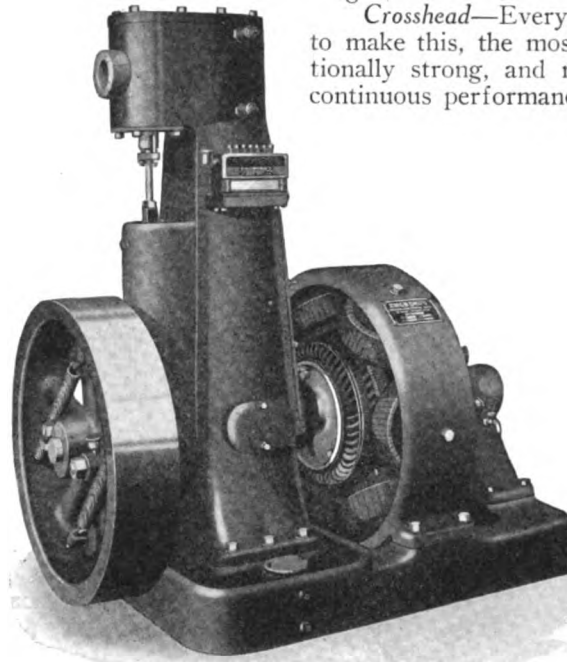
Crosshead—Every precaution has been exercised to make this, the most vital part of the engine, exceptionally strong, and most suitable for dependable and continuous performance.

Valve—The valve is of the balanced piston type of close grained iron and is ground to a perfect fit in the valve chamber. It is accurately fitted to the valve rod and is secured by a nut and lock nut. The lower end of the valve rod is threaded and screws into the valve slide and is secured by the use of a lock nut. By merely loosening on the lock nut, the valve can be easily adjusted or set.

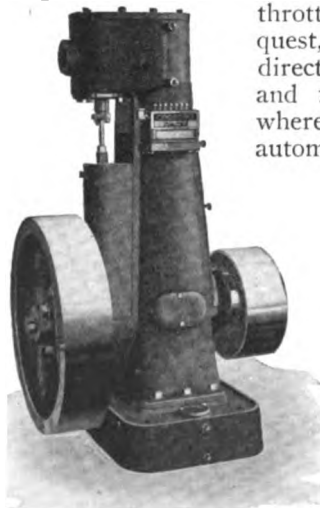
Lubrication—On all engines larger than frame A, the lubricating system is made up with oil pump in base of engine, pumping oil from oil reservoir in base of engine up into distributing oil trough on side of engine frame. This trough is provided with adjustable sight feeds to each bearing.

Then oil is redrained back into base, refiltered and repumped.

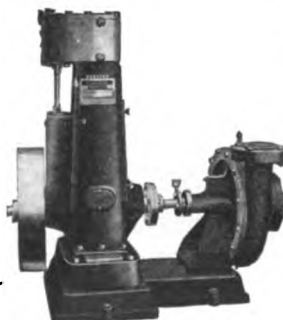
In addition to direct feed to each bearing, the supply pipe leading to crosshead slides, etc., is so liberal as to cause constant dripping on to counterbalances, causing all reciprocating parts to operate in a constant spray.



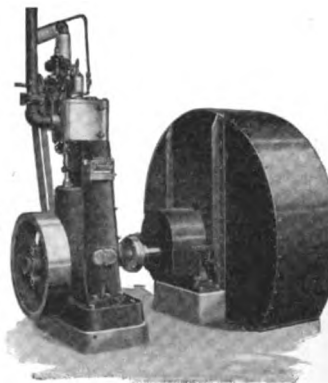
ENGBERG D.C. GENERATING SET
1 to 50 kilowatt



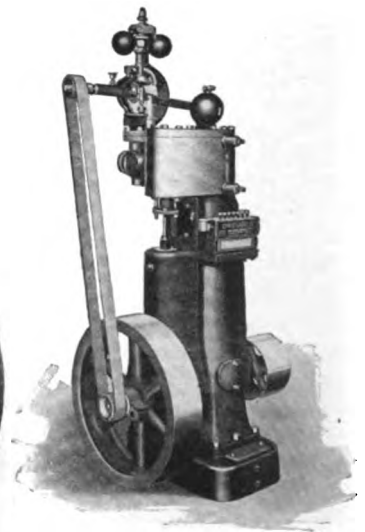
ENGBERG ENGINE



ENGINE CONNECTED TO PUMP



ENGINE CONNECTED TO FAN



ENGBERG THROTTLE ENGINE

Dynamos

Guarantee—Their rating, stability and performance are guaranteed and we will, without cost to the purchaser, within one year from shipment, repair, or at his option furnish another part, f.o.b. our works, in exchange for any part or parts of machine that shall, under normal conditions of operation and under proper supervision and attendance, prove defective.

Impregnated Windings—The shunt and series coils of the Engberg generator are impregnated under vacuum process with a waterproof compound, after which they are subjected to a thorough baking process.

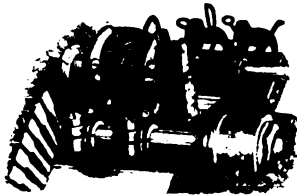
The armature coils are saturated with an insulating waterproof varnish and carefully baked.

All windings are taped and protected to insure satisfaction, even when subjected to unusually rough usage.

Armature—Of the iron clad ventilated type, with laminated core, built of electrical sheet steel, thoroughly japanned before assembling. Drum and core are provided with air ducts, permitting thorough circulation of air. Nothing but best double cotton covered magnet wire of highest conductivity is used, and the insulation is waterproof.

Commutator—Made of copper bars, insulated with best grade mica plate, and is very heavy, insuring years of continuous operation without renewal. Built up on separate sleeve and bolted to armature drum, so the shaft can be removed without disturbing the windings.

Brush Holder Rigging—The brush holder yoke is a heavy iron casting, attached to end bearing, and is of ample strength to insure firm support for the brushes. The brush holders are of the reacting type, and of most modern design. The best grade of carbon brushes for the purpose are used.



BRUSH HOLDER RIGGING

WEIGHTS AND DIMENSIONS OF GENERATING SETS

Engine Frame	K. W.	No. of Poles	Size of Engine	Steam Pressure	Rev. Per Minute	Diameter Pipes		Weight		Code Word 110-125 Volts	Code Word 220-230 Volts
						Steam	Exhaust	Net	Crated		
A	1	4	3 1/2 x 3 1/4	90	750	1	1 1/4	550	600	Bacnaad	Olgaad
A	1 1/2	4	3 1/2 x 3 1/4	90	750	1	1 1/4	575	625	Edcaad	Rogaad
A	2 1/2	4	3 1/2 x 3 1/4	90	750	1	1 1/4	625	690	Fecaad	Spyaad
B	5	4	4 1/2 x 4	90	500	1 1/4	1 1/4	995	1065	Ihecaad	Urgaad
B	5	4	4 1/2 x 4	90	700	1 1/4	1 1/4	985	1040	Jicaad	Wigaad
C	6	4	6 x 5	90	400	1 1/4	2	1825	1925	Lkcaad	Xugaad
C	7 1/2	4	6 x 5	90	500	1 1/2	2	1845	1950	Oucaad	Yvgaad
D	8	6	6 x 6	90	375	2	2 1/4	2860	2985	Pacaad	Azgaad
D	10	6	6 x 6	90	450	2	2 1/4	2900	3025	Srcaad	Bygaad
D	10	6	7 x 6	90	350	2	2 1/4	3000	3125	Tecaad	Fakaad
D	12 1/2	6	7 x 6	90	425	2	2 1/4	3050	3175	Uucaad	Hekaad
F	15 1/2	6	7 x 7	90	400	2 1/4	3	4840	5040	Vucaad	Idkaad
F	17 1/2	6	8 x 7	90	400	2 1/4	3	4850	5050	Yacaad	Jekaad
G	20	6	8 x 8	90	325	3	3 1/4	5400	5600	Azcaad	Lekaad
G	25	6	8 x 8	90	400	3	3 1/4	5450	5650	Dagaad	Nikaad
I	35	8	9 x 9	90	325	3	3 1/4	6800	7000	Ebgaad	Olkaad
I	30	8	10 x 9	90	300	3	3 1/4	7000	7200	Higaad	Sukaad
J	40	8	10 x 10	90	300	3	3 1/4	9650	9950	Iigaad	Upkaad
J	50	8	12 x 10	90	275	3	3 1/2	10750	11050	Ligaad	Ytpaad

Adaptability of Engberg Generating Sets

Direct current, direct connected generating sets can be furnished from 1 to 50 kw.

Alternating current, direct connected generating sets are built from 20 to 75 kv.a., in any standard phase, voltage and cycles.

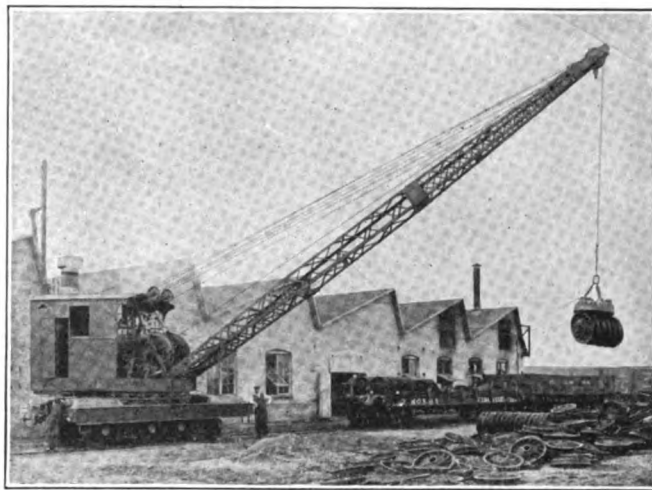
Engberg direct connected generating sets are operating all lines of industry where quality and dependable performance are the first consideration.

For marine lighting sets they are unexcelled, because very compact, requiring little floor space, and will operate continuously with practically no attention.

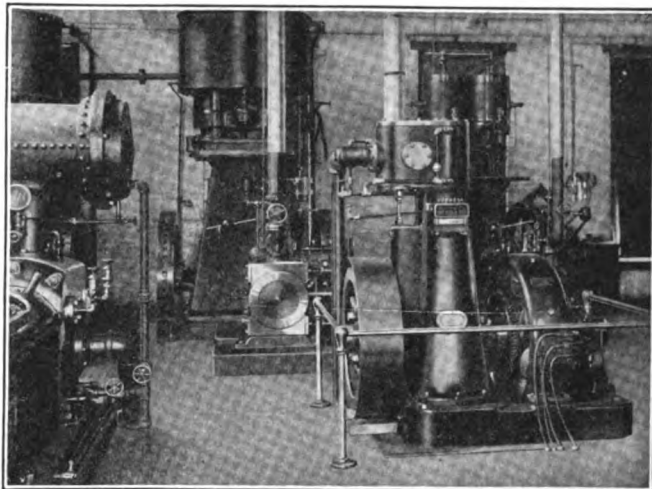
Practically all builders of dredges, steam shovels and magnet cranes, as well as the leading contractors,

railroad and steel corporations have adopted the Engberg set as standard.

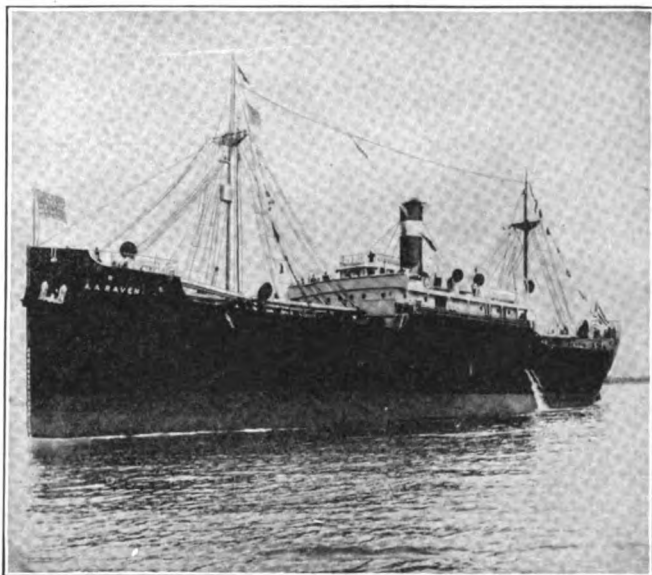
They are used extensively for lighting and power service in factories, hotels and office buildings.



Operating a Magnet Crane



For Lighting and Power Service



Used for Marine Lighting

A FEW ADAPTATIONS OF ENGBERG GENERATING SETS

GENERAL ELECTRIC COMPANY

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SCHENECTADY, N. Y.

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*ARIZONA, Phoenix
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MASSACHUSETTS, Springfield
MASSACHUSETTS, Worcester
MICHIGAN, Detroit
MICHIGAN, Grand Rapids

MICHIGAN, Jackson
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MINNESOTA, Minneapolis
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MISSOURI, Kansas City
MISSOURI, St. Louis
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NEBRASKA, Omaha
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NEW JERSEY, Newark
NEW JERSEY, Trenton
NEW YORK, Buffalo
NEW YORK, Elmira
NEW YORK CITY
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OHIO, Cincinnati
OHIO, Cleveland
OHIO, Columbus
OHIO, Dayton
OHIO, Toledo

OHIO, Youngstown
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*OKLAHOMA, Tulsa
OREGON, Portland
PENNSYLVANIA, Erie
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TENNESSEE, Knoxville
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*TEXAS, San Antonio
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WASHINGTON, Seattle
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WASHINGTON, Tacoma
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WEST VIRGINIA, Charleston
WISCONSIN, Milwaukee

*SOUTHWEST GENERAL ELECTRIC Co.

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INTERNATIONAL GENERAL ELECTRIC COMPANY, INC.

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INDIA: BRITISH THOMSON-HOUSTON Co., LTD., Calcutta and Bombay; INTERNATIONAL GENERAL ELECTRIC COMPANY, INC., Calcutta and Bombay
ITALY AND COLONIES: COMPANIA GENERALE DI ELETTRICITA, Milan
JAPAN: SHIBURA ENGINEERING WORKS, Tokyo; TOKYO ELECTRIC Co., LTD., Kawasaki; INTERNATIONAL GENERAL ELECTRIC Co., INC., Yokohama
MEXICO: MEXICAN GENERAL ELECTRIC COMPANY, Mexico City, Guadaluajara and Monterey
NEW ZEALAND: THE NATIONAL ELECTRICAL AND ENGINEERING COMPANY, LTD., Christchurch, Auckland, Dunedin and Wellington
PARAGUAY: GENERAL ELECTRIC, S. A., Buenos Aires, Argentina
PERU: W. R. GRACE & COMPANY, Lima
PHILIPPINE ISLANDS: PACIFIC COMMERCIAL COMPANY, Manila
PORTO RICO: INTERNATIONAL GENERAL ELECTRIC Co., INC., San Juan
PORTUGAL AND COLONIES: SOCIEDAD IBERICA DE CONSTRUCCIONES ELECTRICAS, Madrid, Spain
RUSSIA: WSEBOSHCHAYA ELEKTRICHESKAYA KOMPANIA, Petrograd and Vladivostok
SOUTH AFRICA: SOUTH AFRICAN GENERAL ELECTRIC COMPANY, LTD., Johannesburg and Capetown
SPAIN AND COLONIES: SOCIEDAD IBERICA DE CONSTRUCCIONES ELECTRICAS, Madrid, Spain
URUGUAY: GENERAL ELECTRIC, S. A., Montevideo
VENEZUELA: WESSELHOEFT & POOR, Caracas

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Where to Get G-E Products

Contact with users of G-E equipment is maintained through Sales Offices. It is directed from the General Office at Schenectady, N. Y., through branch offices which embrace the whole country. Warehouses, conveniently placed, insure prompt deliveries.

G-E motor agencies, headquarters for standard motors and repair service, are located in every city and large town. Small electrical devices are sold by electrical supply and appliance stores everywhere.

Engineering Service

The factories, engineers, and other facilities of the GENERAL ELECTRIC COMPANY are at the disposal of all those in authority and responsible for the successful operation of equipment.

At each district office a specialist of the Company is at the service of persons wishing advice on electrical matters.

Descriptive Publications

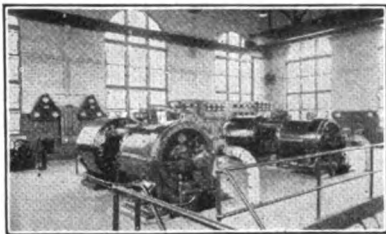
To assist in the proper selection of G-E equipment and supplies, either new or for renewals, many G-E publications are available.

The General Catalogue, distributed to users of G-E equipment, gives descriptions and data on practically all G-E products and, in some cases, identification for ordering. Special bulletins and leaflets give more detailed information on many subjects. They are readily obtainable on request from G-E Sales Offices.

Supply Parts Bulletins and Renewal Parts Catalogues make it easy to order G-E renewal parts accurately and quickly and thus maintain equipment with supplies made by the original manufacturer.

Curtis Steam Turbines

Practically all the electric power produced by large steam stations is generated by turbines. G-E Curtis steam turbines have proved successful not only in large central stations but in extensive applications in industries and manufacturing establishments of all kinds.

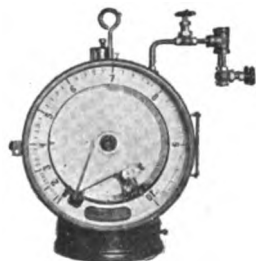


CURTIS STEAM TURBINE PLANT, JOHN A. ROEBLING'S SONS, TRENTON, N. J.

Curtis turbines are built in sizes of 10 kw. to 2000 kw. with direct current generators and from 100 kw. upward with alternating current generators. They are arranged for non-condensing or condensing operation, with or without superheat.

G-E Flow Meters

The GENERAL ELECTRIC COMPANY makes a complete line of flow meters for measuring the flow of steam, water, air, gas or oil through pipes. G-E flow meters are employed in hundreds of industrial and power plants to point the way to greater economies. They are built in several types for various classes of work. They are simple in construction and do not require ideal sur-



INDICATING, RECORDING, INTEGRATING FLOW METER

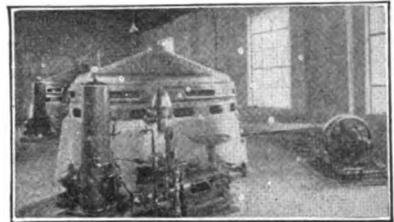


TRADE-MARK

roundings and constant expert supervision to keep them operating. (Bulletin 46501-D.)

Water Wheel Driven Generators

These units are manufactured in capacities from 30 kv-a. to 40,000 kv-a., the result of experience extending over a period of more than a quarter of a century. Both horizontal and vertical types are individually designed to meet most efficiently the various requirements imposed by the supply of water available for any given development and the operating conditions involved in either constant or fluctuating hydraulic heads. The total capacity now in successful operation is considerably in excess of 3½ million kw. (Bulletin 40600B.)



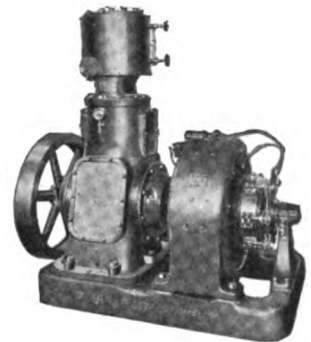
G-E WATER WHEEL GENERATOR, VIRGINIA COTTON MILLS

In addition to water wheel driven generators complete G-E electrical equipment for hydro-electric stations is available, and the service of the Company's engineers is always at the disposal of others to assist in selecting apparatus which will insure safety and reliability in operation and the most efficient utilization of the water power.

Steam Engine Driven Generating Sets

These sets are made for small power plants and for lighting construction operations in isolated places requiring 72 kw. or less. They have the advantage of being manufactured completely at one factory, insuring perfect fit, uniformity of finish, and a thorough test of the combined unit before shipment.

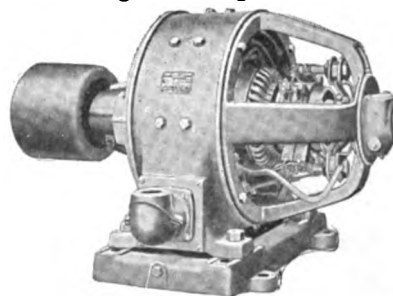
The direct current generators are regularly wound for line voltages of 110 to 125 volts, flat or over-compounded. The alternating current generators are wound for 2300 volts. Both can be furnished for other voltages on special order. (Bulletin 42300A.)



ENGINE DRIVEN GENERATOR SET

Belt Driven Generators

The GENERAL ELECTRIC COMPANY manufactures belt driven, direct current generators in capacities from a fraction of a kilowatt to 300 kw. in standard voltages. Alternating current generators are designed for various frequencies, voltages and phases from 7½ kw. to 550 kw.

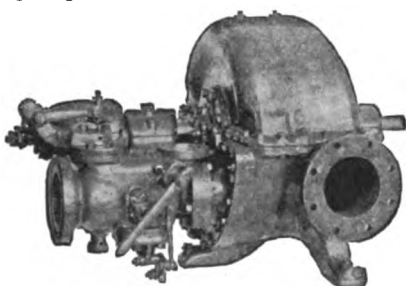


D-C. GENERATOR WITH SLIDING BASE AND PULLEY

Detailed information covering these generators will be supplied on request to nearest G-E office stating capacity needed and service required.

Small Mechanical Drive Turbines

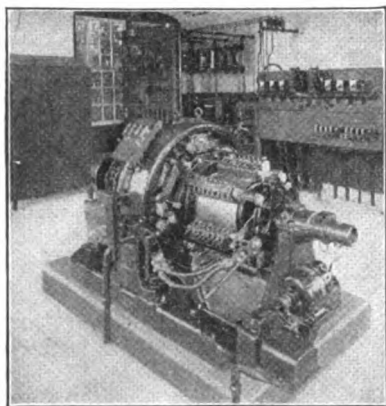
A special form of the G-E Curtis turbine is adapted to driving centrifugal pumps, fans, blowers, and similar industrial apparatus. As in the case of the large G-E Curtis turbines the best materials and workmanship are employed to insure reliability and efficiency. (Bulletins 42019 and 62015.)



SMALL CURTIS TURBINE FOR MECHANICAL DRIVE

Automatic Station Equipment

G-E automatic station equipment offers opportunity for new and important economies in the generation, control and distribution of electrical energy. It has shown automatic switching equipment to be successful



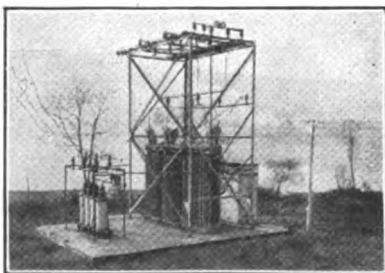
AUTOMATIC SWITCHING EQUIPMENT IN MINING SUBSTATION

in a variety of applications, the more important being the control of synchronous converters, synchronous motor generator sets and induction motor generator sets. Automatic operation is already well established in the central station and electric railway fields, not only in connection with automatic railway substations, but also hydro-electric generating stations which are entirely automatic. Automatic stations totaling more than 200,000 kw. are now operating. Automatic switching has been adopted also in such industries as coal mining, steel plants, etc., and in battery charging stations and office buildings. (Bulletins 62501 and 67712.)

Substation Equipment

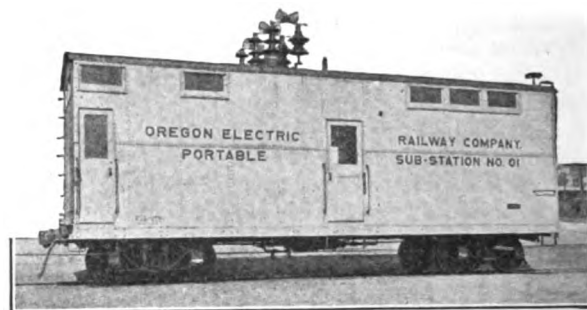
Transformer Substations—Where electrical energy is needed in locations remote from a low voltage distribution system, but accessible to a high voltage transmission line, the outdoor transformer substation offers a means of securing service with low initial cost and maintenance expense, where otherwise the cost would be prohibitive.

G-E outdoor substation apparatus consisting of high tension switching and protecting equipment, transformers, automatic feeder voltage regulators (when required), low tension protective switching and measuring apparatus and housings for secondary apparatus, can be obtained assembled ready for use or separate units can be purchased for assembly by customer. (Bulletin 47706A.)



OUTDOOR TRANSFORMER SUBSTATION

Portable Substations—On electric railways having certain sections where it is necessary to handle heavy traffic occasionally, or where traffic can be normally handled by one machine, economy in operation is obtained and the cost of equipment reduced by the use of a portable substation. Such a substation can be easily transported to any point where additional power is necessary and, in some cases, saves the cost of a spare unit in several substations. Many G-E portable substations, consisting of synchronous converter, transformers, switchboard and accessories, are in successful operation.



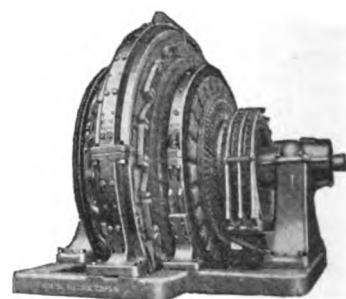
500 KW. PORTABLE SUBSTATION 60,000/1200 VOLTS

Synchronous Converters

G-E synchronous converters are well known through their extensive use by railroads, electric light and power plants, large industrial projects and electrochemical operations.

The commutating pole synchronous converter, introduced by the GENERAL ELECTRIC COMPANY, is now practically a standard design for all the larger sizes. These machines in the smaller sizes are especially suitable where substation equipment is subjected to infrequent peak loads. The momentary overload capacity of the small commutating pole machines, three times normal load, allows the selection of substation units with less regard to the limitations imposed by occasional peaks.

For low voltage industrial and electrolytic work, the regulating pole or booster type of synchronous converter is recommended. By means of the booster the direct current voltage can be varied 15% to 20% in either direction from the average direct current voltage. They can be supplied for nearly all voltages employed in industrial plants.



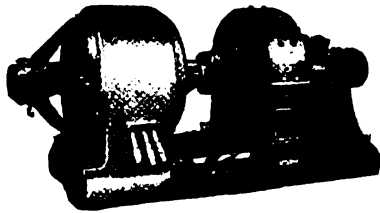
BOOSTER TYPE SYNCHRONOUS CONVERTER

Motor Generator Sets

G-E motor generator sets embrace a wide range of sizes and types. These are described fully in Bulletin 42552A.

With most power being generated and distributed as alternating current there is required a motor generator set, a synchronous converter or some form of rectifier to change to direct current. Practically all street cars are driven by direct current motors; some of the newest and most up-to-date railroad electrification work is direct current; for power work, where variable speed is required, direct current is now generally installed; and for electrolytic and battery charging, direct current is absolutely necessary. See page 742 for further reference to G-E equipment for battery charging.

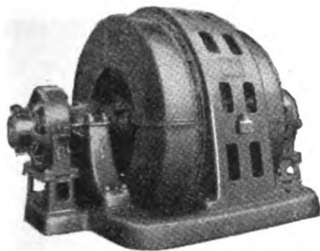
Most motor generator sets therefore are designed to supply direct current, from either an alternating current or a direct current supply. Frequency converter sets, of two alternating current machines, are available for changing current from one frequency to another to tie in different power systems; for example, when a small town, laid out for 25-cycle operation, is absorbed by a power company which operates on a 60-cycle basis.



INDUCTION MOTOR, DIRECT CURRENT GENERATOR SET

Synchronous Condensers

G-E synchronous condensers are used for power factor correction and also for power factor control, the latter application retaining all the advantages of the former and, in addition, maintains constant receiver voltage over the entire range of load for which it is designed.



SYNCHRONOUS CONDENSER

A regular attendant is not always available at the point where the synchronous condenser should be located. Such installations may be provided with automatic starting and control equipment for operation without attendants other than occasional inspections. (Bulletins 41312 and 41311A.)

Static Condensers

These are designed primarily for improvement of power factor. The advantages of static condenser equipment over synchronous apparatus are most pronounced for capacities of 500 kv-a. and less, although in several cases they are more economical at 1000 kv-a. or higher ratings. Other advantages are: comparatively low cost in the smaller sizes; extremely low losses; practically no attendance; long life due to absence of moving parts.

Static condensers have been standardized for circuits ranging in frequency from 40 to 125 cycles, in voltages from 220 to 2300, and in capacities from 30 to 300 kv-a., although they can be supplied for other voltages and capacities whenever necessary. (Bulletin 49714C.)



3-PHASE STATIC CONDENSER

Current Limiting Reactors



3-PHASE REACTOR

Current limiting reactors can be applied to all classes of service where it is desired to control short circuits or limit the current, as in generator leads, busbars, tie and feeder circuits, etc. Under the abnormal conditions which may occur in a system as the result of short circuits, either 3-phase or single-phase, the energy liberated may be of such a magnitude as to exceed the safe rupturing capacity of oil circuit breakers or the mechanical strength of generators, transformers, busbars, etc. A further use of reactors is to give greater continuity of service by limit-

ing the larger part of the short circuit disturbances to the section of the system in which they originate.

Switchboards

The GENERAL ELECTRIC COMPANY offers a complete line of switchboards for all systems of electrical distribution. Industrial and consulting engineers are invited to confer with switchboard specialists stationed in the principal branch offices of the Company. Sketches, detailed drawings and specifications of any such special boards, or the adaptation of standard unit panels will be cheerfully furnished on request. All equipments on G-E switchboards are made by a single company, thus centralizing responsibility for behavior of the entire switchboard.

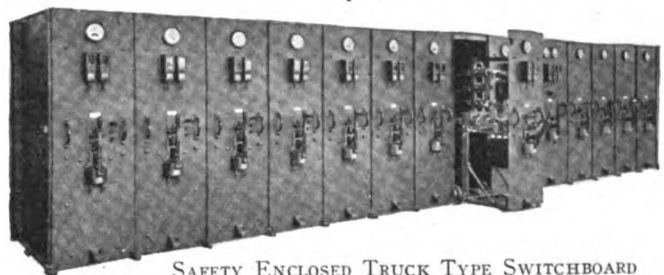
Standard Unit Panels—These have been developed to meet certain conditions which have been found to occur repeatedly. They have not been developed for voltages above 1200 d. c. or 3500 a. c. It is advisable whenever possible to use standard unit panels, for they are less expensive than the other classes, requiring less time to build and ship. They may be ordered simply by one or more catalogue numbers, taken from the Company's switchboard bulletins. Each bulletin covers panels in a distinct class. They are shown in outline and the equipment is specified in every detail necessary for the selection of just what is needed.

The following bulletins are available covering designs for several classes of service. Brief information on these types is given in Index Bulletin 47001A.

One or more Generator Panels up to 240 kw. D.C.	47050B
D.C. Panels for Railway Service, 600 to 1200 volts	47010
Three-wire Lighting Circuit, 10 to 100 kw. D.C.	A4189
Double Polarity, Generator and Feeder, D.C.	47070A
480 to 600 volts A.C., with Oil Circuit Breakers	47133
Small General Service up to 2300 volts A.C.	47135A
Small General Service, 240 and 480 volts A.C.	47131
Induction motor Panels up to 2200 volts	47140A
A.C., General Power and Lighting Service	47190A
3-phase, 3 wire, 240, 480, and 600 volts, Oil Circuit Breakers or Panel	47163
3-phase, 3-wire, 240, 480, 600 volts, Oil Circuit Breaker on Pipe Framework	47164

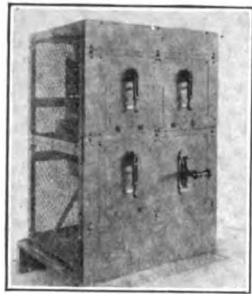
Safety Enclosed Switchboards—Marked progress has been made in developing means which will prevent accidental contact with oil circuit breakers and other parts while alive, and this development has also increased the efficiency of operation by giving greater ease of inspection, adjustment and replacement. The GENERAL ELECTRIC COMPANY has given much attention to questions of safety in switchboard design and has developed several types of safety panels which have proved very successful in service.

Enclosed Truck Type Panels—These make a most desirable switchboard. Each complete unit consists of two elements: the truck or movable element carrying the panel, oil circuit breaker and instrument transformers; the stationary or housing element enclosing the truck (when it is in an operative position), the buses and the terminals of the incoming and outgoing cables. All current carrying parts are completely enclosed when alive, and when withdrawn for inspection or repairs the wiring and apparatus on the truck are accessible from all sides and electrically dead.



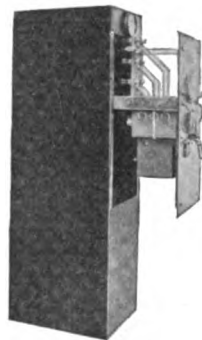
SAFETY ENCLOSED TRUCK TYPE SWITCHBOARD

Enclosed Dead Front Stationary Panels—These are standard unit panels especially applicable where inexperienced or unskilled employees have access to the switchboard. A sheet steel door on the steel front of each switch unit directly back of the operating handle can not be opened when the switch is closed. The switches can also be locked open. These panels may be combined into a switchboard which presents a pleasing appearance and offers all the advantages of dead front, safety operation. Made up with switches and air circuit breakers in capacities desired, 250 or 600 volts.



ENCLOSED DEAD FRONT
STATIONARY PANELS

Safety Enclosed Drawout Panels—These comprise an industrial type oil circuit breaker enclosed in a steel housing and so interlocked with the housing that the panel can be drawn out only when the breaker is in the "off" position and electrically dead. The interlock also prevents the panel from being pushed back into the operating position when the breaker is in the "on" position. Bulletin 67105A gives further information on this latest type of safety panel.



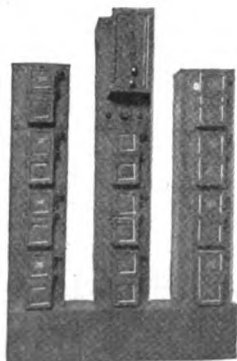
DRAWOUT PANEL

Switchboard Devices

This Company is prepared to furnish with switchboards all of the various devices used in conjunction with them, such as alternating and direct current relays of various types to function on overload, underload, overvoltage, undervoltage, reverse power, reverse phase, etc.; meters and instruments of all types, together with instrument transformers and other accessories; air break switches, air and oil circuit breakers, etc. These devices are also furnished separately. Requests for information regarding them should be addressed to the nearest G-E sales office. See page 728.

Lever Switches

Enclosed Lever Switches—Type LM-4 and LM-5 externally operated enclosed switches with fuse connections have current carrying parts completely enclosed and inaccessible while alive. These switches give positive safety protection and are well suited as feeder switches for industrial motors and to all lighting and power circuits within their rating. For alternating and direct current service, 250 volts up to 600 amperes, made double-, triple- and 4-pole; for alternating current service, 500 volts, up to 400 amperes, triple-pole only. Group mounting of these switches, making an enclosed switchboard as shown, provides an ideal control for a number of feeder circuits from a central point. (Bulletin 67381A.)

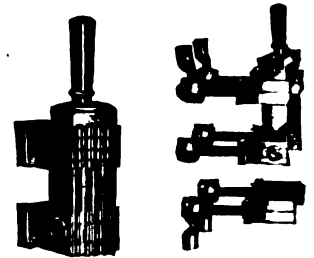


ENCLOSED SECTIONAL
SWITCHBOARD

Types LR-4 and LR-5 switches are also enclosed and can be mounted as units on a panel making an enclosed dead front switchboard.

A steel cover allows access to the fuses from the front of the panel, but only when the switch is open. Made for 2 to 600 amperes, 250 volts, plain lever, and 600 volts quick-break either alternating or direct current.

Open Type Switches—For direct current circuits, the use of lever switches is general: as a circuit breaking device within certain capacities, as a motor starting device (in connection with starting resistances) and as a disconnecting device in series with circuit breakers. For alternating current circuits their use is limited as a circuit breaking device, oil circuit breakers being recommended for large capacities and for circuits above 440 volts.



G-E LEVER SWITCHES

All G-E lever switches are constructed to withstand severe and constant usage and meet all the requirements of the National Board of Fire Underwriters. The open types are made either single or double throw, 1-, 2-, 3-, or 4-pole.

Oil Circuit Breakers

A thorough knowledge of circuit conditions and years of experience in designing and building oil circuit breakers have enabled the GENERAL ELECTRIC COMPANY to place on the market a complete line of these units which fulfill every requirement. This includes breakers for service on potentials up to 220,000 volts, and in current capacities up to 5000 amperes. They are liberally designed, strong in construction and combine every essential for reliability and satisfactory operation. They can be equipped with circuit opening and circuit closing auxiliary switches for electrical interlocking, for indicating or for controlling an auxiliary circuit; bell alarm switches; undervoltage device for tripping breakers and relays for every purpose.

It is impracticable to give fully the details of application and service limitations of the several types of G-E oil circuit breakers. The adjacent table is therefore compiled to refer to descriptive bulletins giving full information on the complete line. These will be mailed on request by bulletin number from readers interested in certain types and sizes.

LIST OF OIL CIRCUIT BREAKERS

Type and Bulletin	Amperes	Volts	Poles	*Application	Operation
FK13 47443	200	3300	2, 3 and 4	Power and lighting service in small plants requiring low interrupting capacity.	Manual, automatic and non-automatic.
FK5 47444	200 300, 500 800	4500 7500 600	1, 2, 3 and 4	Of moderate capacity for power station service.	Manual and solenoid, automatic and non-automatic.
FK12 47448	200 300, 500, 800, 1500	22,000 15,000 4500	1, 2, 3 and 4	Similar to FK5 but higher interrupting capacity.	Manual and solenoid, automatic and non-automatic.
FK35 47445	400, 600 400, 600, 800	7500 600	Single-pole standard units for combining into required number.	Similar to FK5 but has standard unit construction.	Manual and solenoid, automatic and non-automatic.
FK32 45450	400, 600 800, 1200	15,000	Single-pole standard units for combining into required number.	Similar to FK12 but has standard unit construction.	Manual and solenoid, automatic and non-automatic.

*Relays or attachments can be furnished to enable breaker to function on overload, underload, reverse current, undervoltage, etc.

LIST OF OIL CIRCUIT BREAKERS—Continued

Type and Bulletin	Amperes	Volts	Poles	*Application	Operation
FK34	2000	4500	Single-pole standard units for combining into required number.	An extension of the single-unit design.	Manual and solenoid, automatic and non-automatic.
FK25 47471	3000, 4000 5000	600	3	Where it is not desirable to break currents in air.	Solenoid.
FK24 47469	300	35,000	3	Framework mounted, relatively low interrupting capacity.	Manual and solenoid, automatic and non-automatic.
FK52A	400, 600 800, 1200 400, 6000	15,000	3	High interrupting capacity, especially suited for limited floor space.	Manual and solenoid, automatic and non-automatic.
FK52B	800, 1200 1600, 2000	15,000			
47482	400, 600 800	25,000			
FK30	Same rating as FK52	Same rating as FK52	3	Similar to FK52, but higher interrupting capacity.	Manual and solenoid, automatic and non-automatic.
FK36A FK36B and C	400, 800 400, 600	Up to 220,000	3 single-pole standard unit elements.	Very high interrupting capacity, outdoor or indoor service.	Manual and solenoid, automatic and non-automatic.
FH3	Up to 2000	15,000	3	Very high interrupting capacity, indoor service.	Motor, automatic and non-automatic.
FH6	Up to 4000				
FP10 47419A	50	600	3 and 4	Controlling induction motors of 25 h.p. or less.	Manual or shipper rod, automatic or non-automatic.
FK20 47433A	60, 200, 300 60, 200	2500 2500	3 4	Same as FP10 except higher capacity and automatic type can be made non-automatic and vice versa.	Manual
FP15 67424	50	600	3	Especially for controlling textile mill motors.	Manual or shipper rod non-automatic only.
FP4 47415	200	7500	1, 2 and 3	For vertical flat-service mounting in manholes or where there is danger of flooding.	Manual, non-automatic.
FP7 47417	200	15,000	2, 3 and 4	Outdoor breaker for pole mounting for sectioning feeder systems, cutting out transformers, etc.	Manual, non-automatic.

*Relays or attachments can be furnished to enable breaker to function on overload, underload, reverse current, undervoltage, etc.

Air Circuit Breakers

The satisfactory operation given in all kinds of railway, industrial and building service is an indication of the quality and excellent design of G-E air circuit breakers. They come mounted on G-E switchboards or may be purchased separately.

On direct current systems, the use of air circuit breakers is universal as an automatic device for taking care of abnormal conditions on machine or feeder circuits. Some of these conditions are taken care of directly by breaker as a self-contained device, and some by use of auxiliaries acting to trip breaker either mechanically or electrically.

On alternating current systems above 440 volts, air circuit breakers are only rarely employed, since the oil circuit breaker covers the larger part of this field. The conditions most commonly taken care of are overload and undervoltage.

The manually operated air circuit breaker is most commonly used, but with remote control breakers, the station main wiring can very often be laid out to better advantage, resulting in a large saving of cable. For such conditions, electrically operated breakers are available.

All G-E air circuit breakers are approved and listed by the Underwriters' Laboratories, Inc. and will carry full rated loads continuously without exceeding the heating limits specified in the standardization rules of the A. I. E. E. Self-contained solenoid operated breakers up to 3500 amperes alternating current, and 6000 amperes direct current are listed below with references to descriptive bulletins. For breakers above these capacities, refer to the General Office at Schenectady for information.

LIST OF AIR CIRCUIT BREAKERS

Types and Bulletins	Class of Service	Amperes	Volts	Poles	Functions
DIRECT CURRENT					
Type CP 47530	High grade switchboard. Breakers of medium capacity for any service	15-1200 15-1200	250 650	S-P. and D-P. S-P.*	CP Reverse current Overload and reverse current Underload Overload and underload CP, CK and CK2 Overload† Shunt trip Attachments, Low voltage release Shunt trip coil Auxiliary switches Mechanical interlocks Relays
Type CK 47540	High grade switchboard. Breakers of large capacity for any service	1500-6000	250	S-P. and D-P.	
Type CK2 47540	High grade switchboard. Breakers of large capacity for any service	1500-10,000	650	S-P. and D-P.	
Type CG 47520	For motor driven machine tool application, cranes, rectifiers, etc. For light duty. To be used for power and lighting service on isolated boards not over 76 in. high. Should not be used to line up with panels containing Type CP, CK or CK2 breakers	3-300	550	S-P. and D-P.	Overload† Shunt trip Underload Overload and underload Overload, low voltage and reverse current Low voltage and reverse current Attachments, Low voltage release Shunt trip coil Auxiliary switches Relays

ALTERNATING CURRENT

Type CP 47530	For motor driven machine tool application, cranes, rectifiers, etc. For light duty. To be used for power and lighting service on isolated boards not over 76 in. high. Should not be used to line up with panels containing Type CP, CK or CK2 breakers	15-1200 15-1200	480 650	S-P., D-P. and T-P. S-P. and T-P.	Overload† Shunt trip Underload Overload and underload Overload, low voltage and reverse current Low voltage and reverse current Attachments, Low voltage release Shunt trip coil Auxiliary switches Relay
Type CK 47540		1500-3500 1500-3000	480 480	S-P., D-P. and T-P.	
Type CK2 47540		1500-3500	650	S-P. and D-P.	
Type CG 47540		3-300	600	S-P., D-P. and T-P.	

SOLENOID OPERATED BREAKERS†

Type CP3 67550	High grade switchboard. Breakers of medium capacity for any service	15-1200 D-C. 100-1200 D-C. 800-1200 A-C. 100-1200 A-C.	650 650 650 650	S-P. S-P. S-P. S-P.	Overload or non-automatic Overload or non-automatic
Type CK3 67550	High grade switchboard. Breakers of large capacity for any service	2000-6000 D-C. 2000-3500 A-C.	650 650	S-P. S-P.	Overload or non-automatic Overload or non-automatic

*Double pole 250-volt breakers can, with slight changes, be made suitable for 650-volt service.

†Can be made non-automatic by omission of overload parts.

‡Alternating and direct current circuit closing relays can be used to trip solenoid breakers, the contacts of the relays completing the circuit of the trip coils of the breakers.

Wires and Cables

G-E insulated wires and cables are made for a variety of applications. All are tested before shipment, a voltage test of at least twice the working pressure being applied. An insulation test is also made. General information on this G-E line is given in Bulletin 49305.

Rubber Insulation—Three types of rubber insulation have been standardized:

"Red Core" a high class insulation used primarily on wires for house wiring, and is superior to the requirements of the National Board of Fire Underwriters.

"Tricoat" designed for those desiring an insulated wire, somewhat better than "Red Core," but less expensive than the "30 Per Cent Hevea."

"30 Per Cent Hevea" meeting the 1907 Specifications of the Rubber Covered Wire Engineers' Association, a first class rubber compound for absolutely high grade work. (Bulletin 49306.)

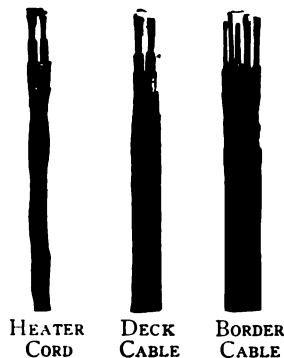
Braided Wire—All wires and cables with N.E.C. rubber insulation, No. 8 B. & S. and smaller, carry a single braid, while No. 6 B. & S. and larger are regularly made with either 2 braids, or 1 tape and 1 braid, and in accordance with underwriters' requirements, are equal to double braid and suitable for conduit work. If 1 tape and 2 braids are required, orders must so specify.

Weatherproof and Slow Burning—Standard weatherproof wires and cables are manufactured strictly in accordance with the requirements of the National Board of Fire Underwriters, with 3 braids placed directly over the copper core, thoroughly impregnated with a black, weatherproofing compound, and then polished to remove all superfluous compound and give a smooth exterior finish. Double braid weatherproof wire is furnished on order.

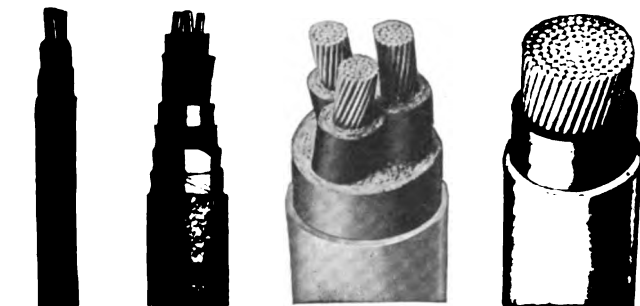
Slow burning wires and cables are similar to the triple braid weatherproof in construction except that the impregnating material is a white, flameproof compound.

Band Steel Armored—The conductors are double taped with mild band steel between two wraps of asphalted jute. Our standard practice is to apply these steel tapings in the same direction, the outer tape covering the joints of the inner. However, if required, the steel tapes may be applied in reverse directions without additional cost, but this construction is not recommended. These cables are especially adapted for mine use, subways and tunnels; on bridges and overhead through city streets.

This cable is also furnished lead incased suitable for direct burial in earth without conduit. It can be applied to



HEATER CORD DECK CABLE BORDER CABLE



RUBBER INSULATED CABLE BAND STEEL ARMORED CABLE THREE CORD PAPER INSULATED CABLE SINGLE CORD 2,000,000 C M CAMBRIC LEADED

any voltage up to 25,000 volts. Its principal use is for ornamental lighting systems for parks, residential districts and small towns. (Bulletin 49308.)

Steel Wire Armored—Similar in construction to band steel armored cables except that one layer of wire is used between the jute wrappings instead of band steel. The cable is designed so that the armor will carry the weight of the cable, if necessary to install in a vertical position. Armored cables without lead may be used in dry mines and subways where cable is subjected to mechanical injury. By lead incasing under the armor this type of cable becomes the standard for submarine work or for use in wet mines. This cable is also adaptable for direct burial in the soil.

Asphalted Jute—Depending on conditions, these consist of leaded or unleaded cables covered with jute coverings and asphalt compound. Such cables are recommended for use in mines, when not exposed to mechanical injury, in wet ducts and for direct burial in the soil, where a tile or board laid over it will give sufficient mechanical protection.

Varnished Cambric and Paper Insulated—Varnished cambric cables are manufactured for all voltages and with either a braided or leaded finish, or if desired, special finishes such as band steel or wire can be applied. Paper insulated cables are also manufactured for all voltages with a lead finish or special finish if required. Paper cables are not made without lead, as the paper absorbs moisture. (Bulletin 49307.)

Connecting Devices—A standard line of cable connecting devices of reliability is also manufactured. It includes copper cable connectors, end bells, cast iron coupling boxes, junction boxes and fuse boxes. (Bulletin 49309.)

Transformers for Distribution and Power Service

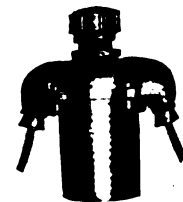
The reliability of G-E transformers as well as their high efficiency have made them preferred by the great central stations and industrial plants where many thousands of kv-a. capacity are now in service. Units have been built for commercial use up to 220,000 volts.

On distribution circuits for light and power Type H transformers are used, which are made in standard sizes from 1½ to 200 kv-a. These can also be furnished for underground or other special service. (Bulletin 45110B.)



TYPE H TRANSFORMER FOR POLE MOUNTING

Primary Cutouts—D & W oil fuse cutouts combine accurate overload protection with high interrupting capacity. They are designed to protect all classes of circuits and especially for junction and primary protection near the source of current. Made in pole and subway types, standard and heavy service. The subway types are well protected against the entrance of moisture and water. (Catalogue 6004.)



POLE TYPE OIL FUSE CUTOUT

Oil Conservators—Oil subjected to transformer heat tends to carbonize, and "breathing" of transformers and moisture condensation in the main tank tend to decrease the original insulating qualities of the oil. These troubles, and the danger of explosion by ignition of the gas mixture

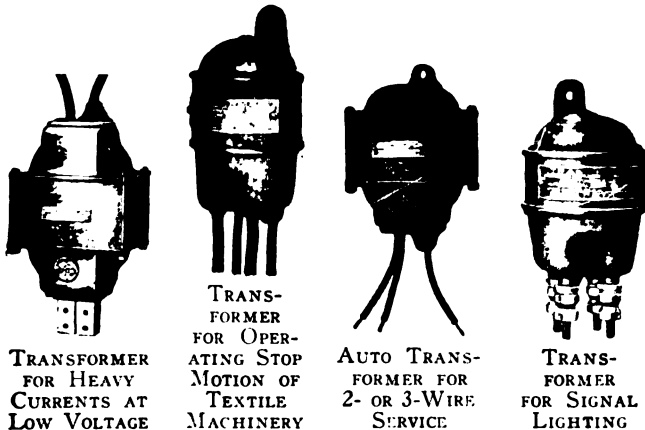
formed, are among those overcome by the G-E oil conservator, which has been adopted as standard equipment for the larger sizes and higher voltages. Its use is equally effective for the smaller sizes and intermediate voltages. (Bulletin 49706.)

Small Constant Potential Transformers

Type M miniature air cooled transformers provide low alternating current voltage up to 500 volts, 15 to 5000-watt capacity, 60 cycles; and 11 to 3000 watts, 25 cycles. The following are some applications:

Electric welding, supplying variable speed motors, railway signal lighting, 2- to 3-phase transformation; operation of small low voltage motors from higher voltage circuits, insulating lighting from power circuits, telephone circuits before rectification from lighting circuits; operating stop motion of textile machinery, etc.

By substituting these transformers for batteries of magneto generators, no maintenance or replacement charges, due to wear, are incurred, less space is required and cleanliness and reliability are assured. (Bulletin 65105A.)



TRANSFORMER
FOR HEAVY
CURRENTS AT
LOW VOLTAGE

TRANS-
FORMER
FOR OPER-
ATING STOP
MOTION OF
TEXTILE
MACHINERY

AUTO TRANS-
FORMER FOR
2- OR 3-WIRE
SERVICE

TRANS-
FORMER
FOR SIGNAL
LIGHTING

Voltage Regulators

Generator Voltage Regulators—G-E regulators are designed to control alternating or direct current stations having a capacity as high as 200,000 kw. They are intended for switchboard use but certain types can be mounted on pedestals. (Bulletin 45450.)

The principal advantages of a steady voltage are: saving in energy; no loss of revenue; reduction in number of switchboard attendants; more economical lamps can be used; fewer lamp renewals.



INDOOR TYPE
FEEDER VOLT-
AGE REGU-
LATOR



BRACKET TYPE
VOLTAGE REGU-
LATOR

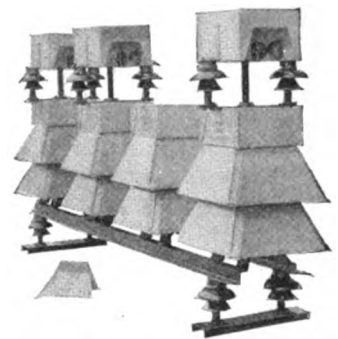
Feeder Voltage Regulators—Feeder voltage may be maintained constantly at normal by installing an induction voltage regulator in each feeder. The advantages are improved service, savings in installation costs, and correct compensation for line drop under all conditions of load. G-E regulators are designed for the control of single-phase or polyphase circuits of any standard voltage, frequency or current capacity. They are supplied for hand or motor (remote) control and are adapted for outdoor use by addition of covers to protect auxiliary apparatus.

Regulators suitable for pole mounting at or near center of load can be used advantageously for regulating voltage of a feeder taken from a transmission or power system and supplying a small village or community. (Bulletin 45450.)

Lightning Arresters

Protection against lightning is required primarily to insure continuity of service and secondly to reduce operating and maintenance loss caused by damage from lightning. The most commonly used G-E arresters are mentioned below:

Oxide Film Arresters—This arrester is for the protection of important alternating current generating and transforming apparatus of any voltage. On account of high speed of discharge and enormous discharge capacity they are capable of quickly and thoroughly relieving lines of dangerous surges. They are especially suitable for the protection of isolated stations and outdoor transformer installations. (Bulletin Y1441B.)



OXIDE FILM LIGHTNING AR-
RESTER FOR OUTDOOR SERVICE

Graded Shunt Resistance Multigap Arresters—These are suitable for indoor or outdoor installation on alternating current circuits up to 15,000 volts. They should be installed in stations and substations, on feeders at receiving points for the protection of motor and transformers, and on lines for the protection of power and lighting transformers. (Bulletin 45603A.)



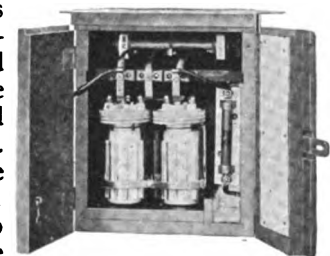
GRADED SHUNT RE-
SISTANCE MULTI-
GAP ARRESTER

Compression Chamber Multigap Arresters—These arresters were designed to meet the demands for an arrester which would give good protection and at such a cost that it could be placed at the terminals of even the smallest transformers. Their high efficiency is due to the combination of the well-known multigap principle with the compression chamber principle of extinguishing the discharge arc. The construction and the materials used are such that the arrester is not only light and compact but also waterproof and fireproof, features which make inspection unnecessary. As long as the arrester is intact, it is in operating condition. (Bulletin 45603A.)



COMPRES-
SION
CHAMBER
MULTIGAP
ARRESTER

Arresters for Electric Railway Service—Direct current aluminum arresters are for the protection of railways cars, generating and substation apparatus where lightning conditions demand the best protection obtainable. They combine the principle of an aluminum cell and a condenser. They have no gap and hence begin to discharge at the slightest rise in potential. (Bulletin 44712.)



D-C ALUMINUM
ARRESTER

Vacuum Tube Arresters—For railway signal, police and fire alarm circuits. (Bulletin Y1557A.)

Horn Gap Arresters—For series arc and incandescent circuits. (Bulletin 45602.)

Choke Coils—For use with lightning arresters on alternating current circuits. (Bulletin Y1584A.)

Railway Signal Accessory Equipment

This Company maintains an organization specializing in the signalling problems of steam railroads and can furnish the following signal accessories:

Battery charging apparatus consisting of motor generator sets, mercury arc rectifiers and "Tungar" battery chargers, which are particularly convenient for charging batteries at outlying points near interlocking stations and at signal maintainers' quarters, either for charging portable storage batteries or doctoring defective batteries. See also page 742.

Lightning arresters suitable for indoor or outdoor installation for high voltage transmission lines. The G-E vacuum tube arrester for indoor installation only for low voltage circuits, meets the requirements of low sparking potential and, at the same time, avoids the danger of short circuits. (Bulletin Y1557A.)

Resistor units mechanically strong and capable of withstanding extremes of temperature such as are encountered in railway signal service. (Bulletins 68947 and 68954A.)

Portable volt-ammeters for testing railway signal apparatus.

Transformers and accessories for power distribution service and for reducing the voltage to a value suitable for signal lamps.

Automatic Signal Substations—By the use of G-E automatic substations, signal delays due to failure of power supply for alternating current systems can be practically eliminated and it is possible to utilize power from more or less unreliable sources. A transmission line supplying automatic block signals or a local load may be supplied from either of two sources; on failure of the normal source, the emergency source is immediately connected and vice versa. No attendance is required other than ordinary maintenance.

Electrical Instruments

The operation of modern high-efficiency electrical machinery would be impracticable and the benefits of its development would be lost if electrical measuring instruments, equally perfected, were not available. In the development of G-E instruments the fundamental aim has been to secure not only high initial accuracy but also permanent accuracy. Types are available for all classes of work. The principal lines are referred to here briefly.

Portable Instruments—For direct current work instruments manufactured on the D'Arsenal principle are the most satisfactory and accurate. Ammeters, volt-

meters, millimeters and milli-voltmeters are available for all kinds of direct current testing and in laboratory work for secondary standards. (Bulletin 46044.)

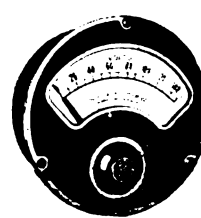
G-E ammeters, voltmeters, power factor indicators, and single-phase and polyphase wattmeters for alternating and direct current are giving entire satisfaction in service. (Bulletin 46044.)

Small, sturdy, pocket instruments are also available, as well as portable curve drawing types with one-day or continuous charts.

Direct Current Switchboard Instruments—Several classes of instruments may be used on direct current switchboards. The best class depends on conditions such as: accuracy required; size of board; character of currents, whether fluctuating or steady; expenditure justifiable; available space; and distance from which they must be read. This Company builds round pattern, horizontal edgewise, semiflush, illuminated dial, and miniature types, described in Bulletin 46045.

Pocket instruments calibrated for switchboard use in very small isolated plants, such as house and yacht installations, are described in Bulletin 46046.

Curve drawing, direct current switchboard instruments are also available in several capacities. (Bulletin 46047.)



ROUND PATTERN
VOLTMETER



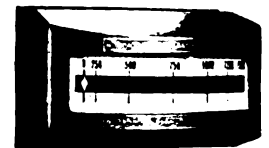
CURVE DRAWING
AMMETER

Alternating Current Switchboard Instruments—For all high grade alternating current switchboard work the horizontal edgewise type of instrument is recommended, although round pattern instruments can be supplied where the cost of the former is not warranted. For alternating current arc circuits, series incandescent circuits and series rectifier circuits, instruments with special insulating covers are recommended. These are all described together with synchronism indicators and ground detectors in Bulletin 46046.

As in the case of direct current instruments mentioned above, alternating current switchboard instruments can also be furnished in pocket and curve drawing types.

Instrument Transformers—Portable G-E transformers for use with portable ammeters, voltmeters and wattmeters will be found both convenient and accurate. They are suitable for measuring 5 to 1000 amperes and potentials above 750 volts when it is not desirable to use multipliers. (Bulletin 46030.)

G-E switchboard type current transformers com-



HORIZONTAL EDGE-
WISE AMMETER



PORTABLE VOLTMETER



CURVE DRAWING IN-
STRUMENT



TYPE P2 PORTABLE CURRENT
TRANSFORMER

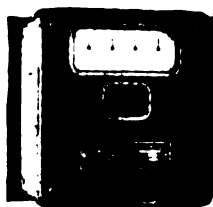
prise a complete line for use on circuits up to 70,000 volts. Potential transformers of high accuracy and high insulation for all measurements above 750 volts are also described in Bulletin 46049.

Watt-hour Meters—The GENERAL ELECTRIC COMPANY builds a complete line of watt-hour meters for all classes of service; direct current and alternating current, single-phase and polyphase, for switchboard, house or portable service. For further information on the single-phase meters, send for Bulletin 46201A. Bulletin 46253A describes the polyphase types.

Thomson astatic watt-hour meters are direct current instruments, especially designed for switchboard use. They are made in back-connected form only and enclosed in a rectangular glass case. Finish is dull black. (Bulletin 66351.)



Direct Current



Alternating Current

SWITCHBOARD TYPE WATTHOUR METERS

Warren Master Clocks

This device enables an operator to maintain the speed of alternators at a constant average value. It comprises a high grade pendulum clock and a small self-starting synchronous motor. Each actuates independently a hand on the dial of the master clock. When the frequency is correct, the hands rotate at the same speed. The operator adjusts the generator speed so that the hands are always together.

Aside from the advantages accruing from better frequency regulation, this system offers a means of obtaining an accurate measure of time through the use of a small synchronous motor connected anywhere on that system. The synchronous motor is adaptable to such devices as time stamps, steam flow meters, recording instruments, "in" and "out" recorders, etc. (Bulletin 46037.)

WARREN MASTER
CLOCK

Motors and Control

G-E motors are available for every kind of service. A few of the many types are described here briefly and for further information send for bulletins referred to or consult the nearest G-E office (see page 728).

Reliable starting and controlling apparatus has also been developed for the successful operation of all G-E motors. Some of these control equipments are listed on the pages following, together with brief descriptions. Further information will be gladly furnished by control specialists in G-E Sales Offices.

Synchronous Motors—The synchronous motors may be applied to most any industrial service but its greatest value is obtained when used on circuits which need power factor improvement. This condition is often indicated by the need for greater genera-

tor transformer or feeder capacity. Synchronous motors are particularly desirable, therefore, when power is purchased at a rate which is dependent on the power factor of the load. They are also suitable where dirty operating conditions make a motor with a small air gap inadvisable.

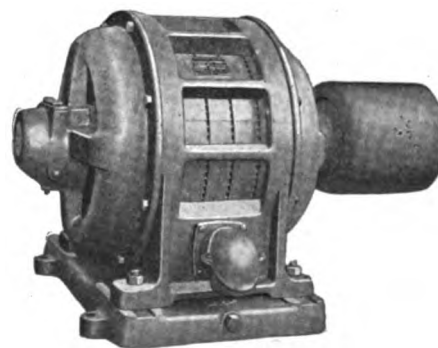
This Company has designed a complete line of synchronous motors covering a wide range of speeds and capacities which are in extensive use in many industries driving rolls, compressors, pumps, grinders, crushers, blowers, fans, conveyors, etc.

Alternating Current Brush Shifting Motors—Type BTS 3-phase motors give high efficiency at a large number of speeds. Speed changes and starting and stopping are obtained by merely shifting the brushes. They have been developed in sizes from 10 to 100 h. p., inclusive, for 60 cycles. Slow speed, 100-, 125- and 150- h. p. motors can be furnished for 25 cycles.

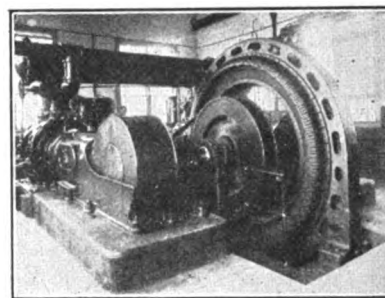
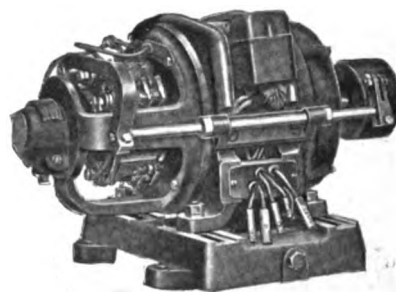
A brush shifting controller used with these motors gives a variation of 50% below synchronous speed or any intermediate speed. Movement of the controller handle, to which is attached a chain for moving brush rigging, also opens and closes the line circuit as required and can reverse direction of the motor.

Type BSS Motors—Single phase, furnished in sizes $\frac{1}{4}$ to $7\frac{1}{2}$ h. p., 1200 and 1800 r. p. m., 60 cycles interchangeable on 110- or 220-volt circuits. Suitable for constant torque, belt or chain drive (fans and blowers, printing presses, refrigerators and laundry machinery, etc.), and will permit 50% speed reduction against full load or three-quarters load torque. These motors will start and accelerate loads having two and one-half times full load torque. They accelerate fast and have an overload capacity of 50% momentarily. (Bulletin 61401.)

Constant Speed Induction Motors—The qualities essential to satisfactory operation have been obtained in GEN-



TYPE KT INDUCTION MOTOR

G-E SYNCHRONOUS MOTOR DRIVING
COMPRESSOR

TYPE BSS BRUSH SHIFTING MOTOR

ERAL ELECTRIC COMPANY'S polyphase motors by careful attention to all details of design, manufacture, and inspection, as an examination of the motors will show.

Type KT polyphase mo-

tors are built with riveted or skeleton frames in sizes from $\frac{1}{2}$ to 750 h.p., standard voltages. They are adaptable for driving all classes of machines requiring constant speed. Sizes 1 to 200 h.p. are described in Bulletin 41302A.

Multispeed types are 3-phase, wound for 60-cycle service only, standard voltages. They can be furnished up to 12 h. p. at four constant speeds: 1800, 1200, 900 and 600 r. p. m. Constant horsepower motors are suitable for machine tools, etc., and constant torque motors for operating such machinery as fans, blowers and printing presses.

Hand and automatic starting compensators and other controlling apparatus can be supplied.

Varying Speed Induction Motors—Type MT motors with phase wound rotors and external resistance are adapted for service requiring frequent starting under load or starting of loads with high inertia. High starting torque is obtained with a comparatively small amount of current from the line.

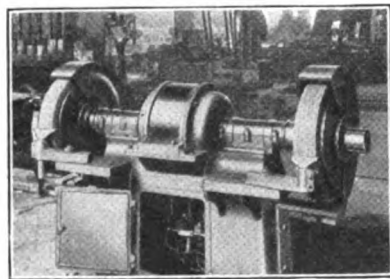
These motors have standard ratings up to 200 h. p. standard frequencies. Special rating to 6000 h. p. for heavy duty such as driving steel rolling mills.

High speed Type MT induction motors, ranging from 75 to 350 h. p., for direct connection, can also be furnished.

Induction Motors for Pumping—These motors, with closed box-frame construction are especially adapted for pump service where moisture is often present and, as in the case of mine installations, where water often drips upon the motor. Special moisture resisting insulation is used. The motors are self-ventilating and have high efficiency. Made in capacities from 75 to 400 h. p. and in both squirrel cage and slip ring types. The control equipment used is similar to that recommended for ordinary constant and varying speed induction motors. (Bulletin 61301A.)

G-E vertical induction motors are readily adapted for installation in mine shafts or other convenient places since the motor can be located at any convenient height above the pump.

High Speed "Built-in" Motors—Special high speed induction motors operating as high as 25,000 r. p. m., taking power from a special frequency changer motor generator set, give highest efficiency when made



G-E MOTOR BUILT INTO SAFETY EMERY WHEEL

an integral part of the machine. These motors are particularly suitable for driving separate cutter heads on wood-working machines, and as many as nine motors have been built into one machine. They are constructed similar to the standard squirrel

cage motor and have rotors of the cast alloy type. Through the co-operation of G-E engineers with leading machine manufacturers successful application has been made to woodworking machines, such as shapers, saws, tenoners and drills, grinders and for other uses requiring speeds from 7200 to 12,000 r. p. m. Hand or magnetic control apparatus is furnished for machines so equipped. (Bulletin 41521A.)

Mine Type Motors—Type HI motors have high starting effort, large capacity for overloads and strong construction which fits them admirably for driving breaker and tippie machinery and for service under

severe operating conditions as found in mine work. They are built for constant and for variable speed, in standard sizes from 5 to 75 h. p., 3-phase, with or without back gearing. Special control apparatus designed for mine use can be supplied.

For direct current the Type MC motor is available, built for severe service and no attention. It has waste-packed bearings and is protected from dripping water. Suitable for driving portable or stationary pumps, for fans, coal loaders and other machines. Sizes up to 15 h. p.

Single-phase Induction Motors—Type RI, single-phase motors are built for constant speed in sizes from $\frac{1}{2}$ to 15 h. p. For reversing service, they are furnished in sizes $\frac{1}{2}$ to 7 $\frac{1}{2}$ h. p. The non-reversible motors may

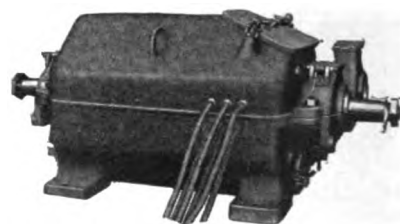


TYPE RI INDUCTION MOTOR

be made reversible with reduced rating by simply adding four leads and re-setting brush yoke. The reversible motors are especially useful for application to elevators, small cranes and hoists, laundry machinery, etc. These motors start and accelerate loads having two and one-half times full

load torque and will stand a 50% momentary overload. Other characteristics are given in Bulletin 61508 on reversing motors and Bulletin 61200B on standard, constant speed types.

Alternating and Direct Current Mill Type Motors—Types MI and MD motors are of special design for severe steel mill service. In addition to cranes and reversing auxiliary machinery in steel plants, they are successfully applied to shears, ore and coal bridges and unloaders, charging machines of all types (coke pushers, levelers, etc.), heavy duty fabricating and erecting shop cranes, electric shovels, dipper dredges, capstans, gates, valves, draw and lift bridges, and small heavy duty hoists. They are furnished totally enclosed in sizes from 3 to 150 h. p., alternating current, and 4 to 175 h. p., direct current. The open type motors are built from 25 to 150 h. p. alternating current and 30 to 210 h. p. direct current for continuous duty. (Bulletins 48121.1A and 48143.1.)



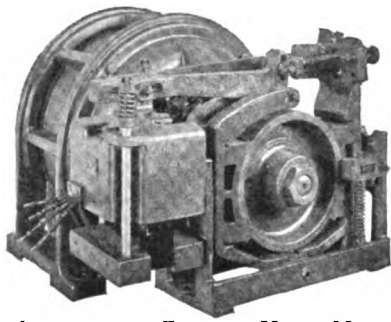
TYPE MI MILL MOTOR

Electric brakes and other control equipment can be furnished with these motors for any service.

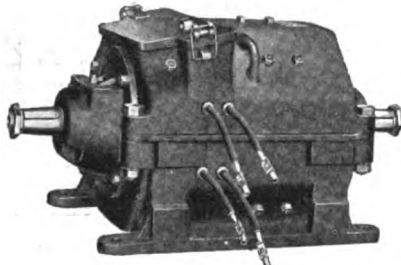
Alternating and Direct Current Crane and Hoist Motors—Type MTC motors give a maximum torque for a given weight and are very strong mechanically. They are used for hoists and similar service of an intermittent nature where the limiting feature depends upon the frequent starting and accelerating torque required. Regularly furnished with open frames and taper shafts on each end for gear and solenoid brake. Made 2- and 3-phase, for standard frequencies, in capacities of 1 to 300 h. p.

CO 1800 crane and hoist motors for direct current are designed for intermittent service requiring a maximum torque motor of ample overload capacity. They are especially suited for variable speed crane and hoist service as applying to bridge and cargo cranes, winches, derrick hoists, ore bridges and unloaders, etc. They are made for floor, wall or ceiling mounting and furnished with or without back gear. All parts are arranged to facilitate easy repair and inspection. Sizes range from 2 to 100 h. p., standard voltages. (Bulletin 68100B.)

Electric brakes, crane control panels, and other specially designed control equipment can be furnished for all crane or hoist service.

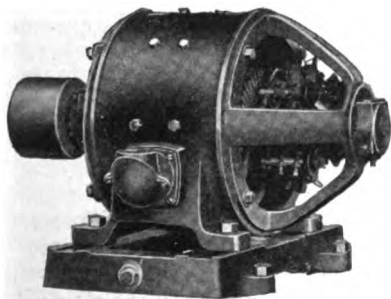


ALTERNATING CURRENT HOIST MOTOR AND BRAKE



CO 1800 CRANE AND HOIST MOTOR

Direct Current Constant Speed Motors—The Type RC motor may be classed as the universal direct current motor. It is made open, semienclosed and totally enclosed. Furnished for constant speed; shunt wound for conditions requiring close speed regulation; compound wound for heavy starting torque or where violent power fluctuations occur; series wound where load either possesses fixed values or may be made subject to

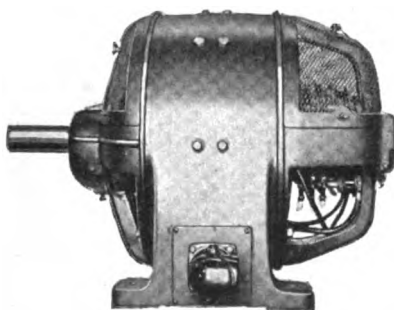


TYPE RC CONSTANT SPEED MOTOR

automatic or manual control. Shipped for floor installation but can be readily arranged for wall or ceiling suspension. The 1/2- to 200 h. p. sizes are described in Bulletin 41013A.

Direct Current Adjustable Speed Motors—Type RF commutating pole motors have been designed for machine tools and similar service where wide variation and adjustment of speed independent of load is required. They are made in sizes from 2 to 50 h. p., 230 volts and 550 volts. Speed adjustment by field 2 to 1, 3 to 1, or 4 to 1. (Bulletin 41021A.)

Type RA motors are made in sizes from 1/2 to 1 1/2 h. p., 115 and 230 volts. Speed adjustments, 2 to 1 or 3 to 1.



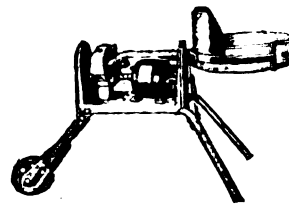
TYPE RF ADJUSTABLE SPEED MOTOR

Fractional Horsepower Motors

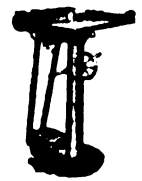
The GENERAL ELECTRIC COMPANY has studied extensively problems of electric motor application to household appliances, small tools and other machines, and is, therefore, in a position to help other manufacturers with similar problems. Almost innumerable are the applications in the plant, machinshop and laboratory for G-E fractional horsepower motors which, although built as small as 1/200 h. p. embody the same quality of material and accuracy of construction as the larger G-E motors. The motors are built in alternating current, direct current, or universal types, and the different types can be supplied in the same frames so as to be mechanically interchangeable. G-E control devices, push buttons, lever switches, rheostats, etc., can be furnished with all types.



Disk Grinding Machine



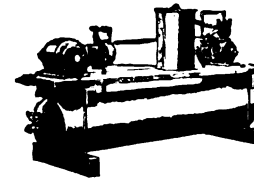
Factory Riddle



Power Saw



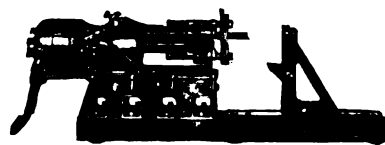
High Speed Drill



Air Compressor



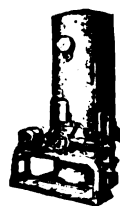
Tapping and Drilling Machine



Bench Riveter



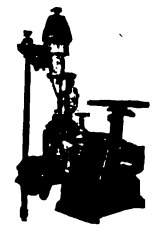
Portable Electric Drill



Water Pump



Portable Riveter



Water Wheel Governor

A FEW APPLICATIONS OF G-E FRACTIONAL HORSEPOWER MOTORS

These devices are not manufactured by the GENERAL ELECTRIC COMPANY, but show uses for which the small G-E motor is admirably adapted

Following is a partial list of industrial applications of fractional horsepower motors. These may suggest a means whereby problems can be solved. Some of these applications are illustrated above.

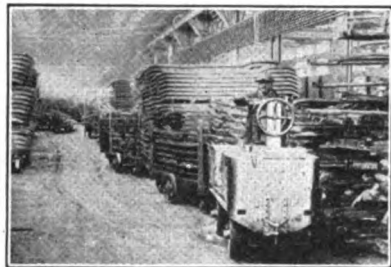
Industrial Applications of Fractional Horsepower Motors

Air compressors
Bag filling machines
Fans, blowers and exhausters
Boiler tube cleaners
Conveyors
Drill presses
Portable drills
Flow surfaces
Buffers, grinders and polishers
Weighing machines
Winding machines
Centrifuges
Screwdrivers
Vibrators
Boring machines
Drying drums

Valve operations
Nailing machines
Lathe drive
Machine tools
Oscillators
Riveting machines
Saw setters or trimmers
Spinning machines
Automatic switches
Pipe cutters
Planers
Punch presses
Shears
Stone dressers
Saws: hack, band, circular, jig
Pumps: liquid, air and vacuum

Automotive Motors

Storage battery vehicles require highly specialized motors which differ widely in mechanical and electrical characteristics from direct current motors for propelling street cars. Sparkless commutation, great overload capacity and maximum torque per ampere are important



TRACTOR WITH G-E MOTOR HAULING HEAVILY LOADED TRAILERS

factors in electrical design and, mechanically, the automotive type motor must have great strength, durability and accessibility, and every ounce of useless weight must be eliminated.

G-E automotive motors are applicable to the requirements of the light industrial truck or heavy road-duty vehicles. The plain cylindrical frame allows the motor to be mounted on the chassis by means of brackets or cradles which can be easily designed and applied by the vehicle manufacturer.

Due to the extremely specialized nature of the automotive motor drives, all inquiries should be sent to the nearest G-E Sales Office.

Motor Control Equipment

The success of electric motor operation is greatly dependent upon proper starting and controlling apparatus. Therefore, in the selection of an electric drive, the operating requirements of the machine should determine not only the type of motor needed but also the kind of control best suited. Controllers have several uses, the most common functions being:

Starting and stopping; undervoltage protection or undervoltage release; overload protection; reversing the motor; varying the speed of the motor.

G-E controllers can be obtained with provisions for any one or more of the functions.

G-E Control for Every Purpose—The GENERAL ELECTRIC COMPANY, out of experience gained in extensive design and manufacture of motor controlling equipment and in years of application engineering, has evolved complete lines of standardized apparatus. The Company is, therefore, in a position to supply readily control apparatus for all ordinary drives and, where special problems are involved, a complete control system can be designed. Major attention is given to quality, and those parts necessarily subject to wear are made easily renewable. G-E controllers include:

Hand starters; drum controllers; magnetic controllers for use with push buttons and other accessories; enclosed starters; oil immersed starters.

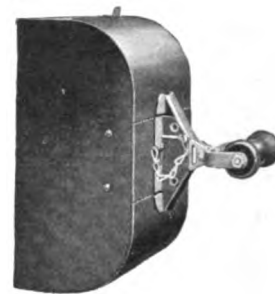
These several types and designs make it possible to select an equipment especially suited for particular conditions found in any industrial work. It is obviously impossible to describe on these pages, even briefly, a significant portion of this line of equipment. Requests for complete information are welcomed at the nearest G-E sales office. See page 728.

Manual Control—Simple hand operated starters are available for small and medium sized motors that are not started and stopped frequently, and when a competent operator is available.

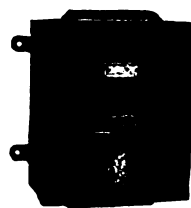


FP10 OIL CIRCUIT BREAKER

For throwing small alternating current motors directly on the line



CE1038 QUICK-MAKE-AND-BREAK STARTING SWITCH



CR1003 ENCLOSED HAND STARTING RHEOSTAT FOR DIRECT CURRENT MOTORS



CR1034-N1 HAND STARTING COMPENSATOR FOR SQUIRREL CAGE INDUCTION MOTORS



DRUM SWITCH FOR ADJUSTABLE SPEED DIRECT CURRENT MOTORS—STARTING AND FIELD RESISTOR ON BACK

Drum type controllers are generally used with motors that drive machines requiring frequent starting and stopping or speed adjustments. They are necessarily of sturdy construction, all live parts being enclosed to protect the operator, and are made to resist dust, weather and mechanical injury. Drum controllers can also often be mounted advantageously on machines and operated remotely through gears, splined shafts, etc.

The drum switch requires very little floor space and can be mounted convenient to the operator; the resistors, being separate, can be located out of the way. Resistors are available for starting, armature control, field control, and dynamic braking, depending on the type of motor and nature of application.

Magnetic Control—The field for magnetic control is practically unlimited. It is also the basis for automatic control since it can be made to "do the thinking," often removing the human element and providing for unfailing mechanical operation. The use of magnetic control actuated from remote points



ENCLOSED MAGNETIC SWITCH FOR STARTING ALTERNATING CURRENT MOTORS



OIL IMMERSSED AUTOMATIC STARTER FOR DIRECT CURRENT MOTORS

cuts down operating costs by replacing labor and reducing the number of attendants necessary; it speeds production by making possible the maximum safe rate of acceleration and deceleration, with consequent maximum average speeds.

Accessories for Magnetic Control—Various accessories are available for use in connection with magnetic starters for operating motors from remote points or independently of operators. The principal ones are: push button stations, emergency switches, limit switches, pressure switches, float switches, and thermostats.

The CR1031 float switch provides for starting and stopping the motor, depending on the liquid level in either tank or sump. (Bulletin 68501A.)

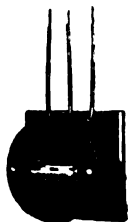
For controlling motors driving liquid pumps or air compressors, the CR2922 pressure governor or CR2925 pressure switch can be used. (Bulletins 68411 and 68502A.)



ENCLOSED AUTOMATIC STARTING COMPENSATOR FOR STARTING SQUIRREL-CAGE INDUCTION MOTORS



START AND STOP
PUSH BUTTON STATION



THERMOSTAT



PRESSURE SWITCH

The CR2990 thermostat provides automatic control of motors according to temperature variations. Being unaffected by moisture, it is particularly adapted for refrigeration work. (Bulletin 68500.)

Electric Haulage Equipment

Railway Locomotives—G-E electric locomotives embrace units for moving practically all classes of rolling stock. The line extends in standard sizes up to a 280-ton locomotive which was built for heavy freight service. The G-E passenger locomotives for service at 3000 volts, D. C., on the Chicago, Milwaukee and St. Paul Railway are described in Bulletin 44102.

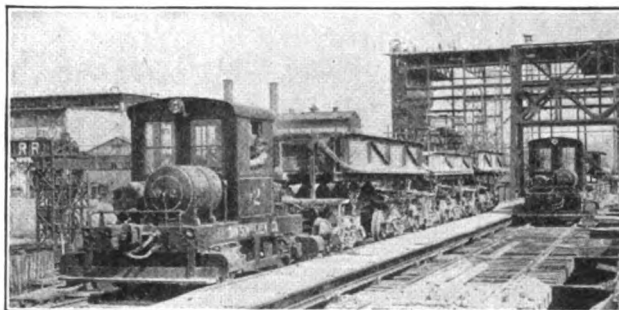
Switching Locomotives—Almost every inter-urban road will find an electric locomotive a useful adjunct to its regular equipment. With a reserve unit of this kind to switch freight at terminals and to haul trains, the regular motor cars are released from this class of duty, and the equipment of the locomotive, being specially designed for freight service, is capable of performing it in a more satisfactory and economical manner.

This Company builds a standard type of 25-ton electric locomotive for such service although its weight may vary between 22 and 35 tons, according to the requirements. Locomotives of this type have been

extensively used as switching units in large industrial plants and for switching service in the terminals of interurban roads. The design is such as to give maximum economy in materials of construction and at the same time maximum strength and rigidity. (Bulletin 44250.)

Industrial Locomotives—The electric locomotive is adapted to play an important part in meeting the transportation requirements of all industries. The inter-factory transportation of large plants with buildings scattered over considerable areas can be handled most satisfactorily and economically by small locomotives. They are equally well adapted for service in brickyards, stone quarries, cement plants, etc., in getting ore from mines to stamp mills, hauling log trains to sawmill, in large public works and in tunnel driving. G-E locomotives in industrial service of many kinds are illustrated in Bulletin 44251.

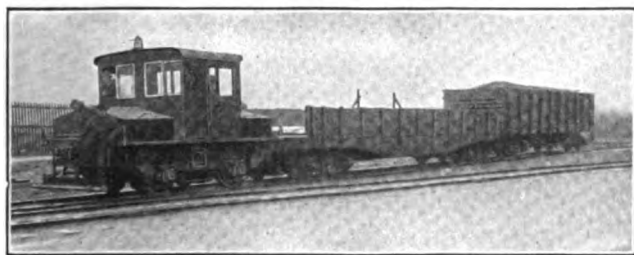
Where a manufacturer operates locomotives of his own the electric type has the following summary advantages over the steam engine: (1) consumes power only when in actual operation; (2) can be operated by one man of ordinary intelligence; (3) ready for use at all times; (4) has large momentary overload capacity; (5) has easily operated control; (6) has low maintenance cost due to comparatively few wearing parts; (7) requires attention only when in use; (8) can be run inside a building where smoke and fire risk would forbid the use of a steam locomotive.



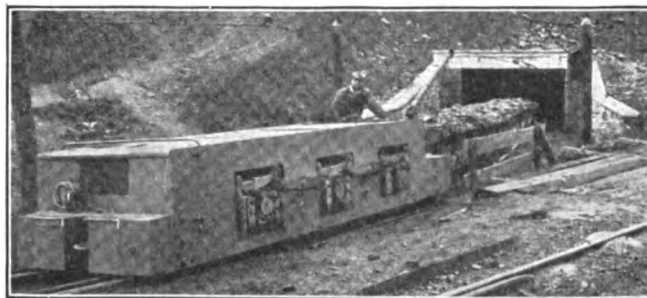
G-E INDUSTRIAL LOCOMOTIVES AT UNLOADING PIER, DAVISON CHEMICAL CO.

Storage Battery Locomotives—These are well adapted for short distance hauls at low speeds, handling material in and about factory buildings. By providing the elevators with tracks, they can be effectively used to distribute material on different floors and can be safely used where sparks would involve danger. Large types up to 30 tons are built for heavier service. (Bulletins 64250 to 64257.)

Mine Haulage Locomotives—This Company has been engaged in the manufacture of mine locomotives for the past thirty years, and as evidence of durable construction can point to some of its first locomotives built, which are still in active service. This is proof that the Company appreciates the severe conditions of mine service, and builds locomotives to stand up under most trying conditions.



G-E 15-TON STORAGE BATTERY LOCOMOTIVE IN SWITCHING SERVICE

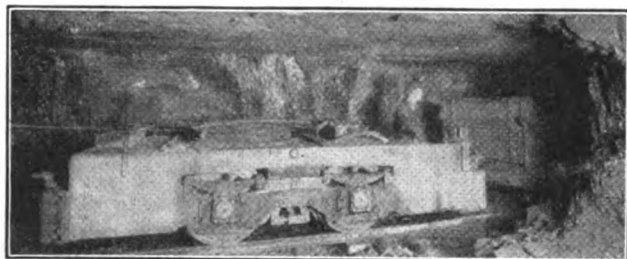


TROLLEY TYPE 20-TON G-E ELECTRIC MINE LOCOMOTIVE

The two-motor locomotive for sizes under 25 tons is recognized as the standard type for mine work. There are two forms of this type, outside- and inside-frame, the selection of which is determined by the mine conditions.

G-E mine locomotives of the trolley type have spring construction with equalizing bar, which gives a more equal distribution of wheel load and increased pulling power.

Gathering Locomotives—A gathering locomotive with cable reel is available for short haulages between the working face and entry. This type is of particular value in mines where the seam is thin. (Bulletin 64200B.)



G-E GATHERING LOCOMOTIVE WITH ELECTRIC CABLE REEL

Railway Line Material

This Company has developed a complete line of material used in the construction of overhead trolley systems and track return for electric railways in every service. This includes pole brackets, suspensions and cars of many types, strain and feeder insulators, splicing sleeves, trolley frogs and crossings, section switches and insulators, turnbuckles, rail bonds, bonding tools, etc. Special forms have been developed to meet the special conditions of mines and other industrial properties.

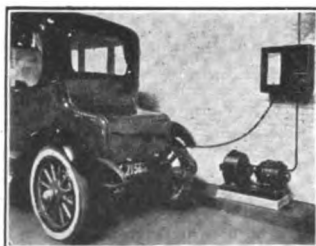
These devices have been designed to meet every possible condition and have been thoroughly tested. Sherardizing is the standard finish and protection for all iron and steel parts. Japan finish can be furnished for use where devices are subject to the deteriorating effects of acids. (Bulletin 44004B.)

Rail Bonds—Owing to the many types and the variation in dimensions of rails and joint plates in common use, a great variety of forms of bonds has been developed. Occasionally exceptional cases arise requiring some modification of one of the standard forms in order that the best results may be obtained. The Company will gladly submit recommendations showing how best to meet any bonding conditions and its engineering department is always at the service of customers to give advice. (Bulletin 44002A.)

Battery Charging Equipment

The GENERAL ELECTRIC COMPANY is prepared to furnish charging equipment for all classes of service.

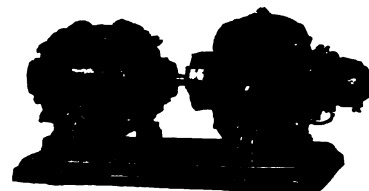
Individual Vehicle Battery Charging Sets—These sets can be furnished for service on various frequencies, either single-phase or polyphase circuits of standard vol-



VEHICLE BATTERY CHARGING SET

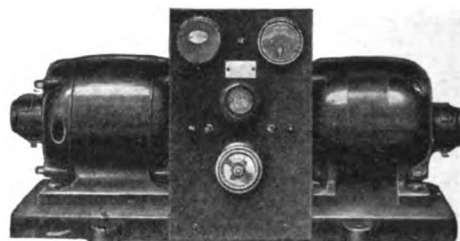
tages and in suitable capacities for charging lead batteries of 44 cells and under, or Edison batteries of 60 cells and under. The selection of the proper set for any particular charging work depends on the make of battery and type of cell, as well as the frequency, voltage and number of phases of the alternating current supply. (Bulletin Y1532A.)

Multiple Battery Charging Sets—These motor generator sets are for charging simultaneously two, three and four industrial trucks or tractors. When charging two or more batteries in multiple, they are used with multiple circuit switchboards, necessarily different from the control panels for the individual charging sets, in order that batteries of different degrees of discharge can be properly handled. (Bulletin Y1364B.)



MULTIPLE BATTERY CHARGING SET

Starting and Lighting Battery Charging Outfits—The motor generator sets for charging starting and lighting batteries consist of a small, compact 4-bearing motor generator set on which is mounted a small steel switchboard completely equipped. These outfits are furnished in capacities of 250, 500 and 750 watts, giving a range of sizes the smallest of which will charge any combination of one to four 6-volt batteries and the largest any combination of three to twelve 6-volt batteries. Larger sets wound for 37½ volts, 30, 50, 75 and 100 amperes, in 3-bearing construction with common base are also available. (Bulletins B3432A and Y1369B.)



STARTING AND LIGHTING BATTERY CHARGING SET

Charging Outfits for Large Garages—The problems of selecting battery charging outfits for large garages present conditions so diversified in character that it is best to take up each case individually with the supply department of the Company.

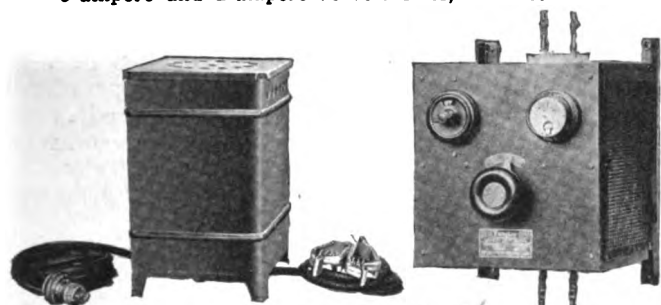
Mercury Arc Rectifier Sets—For charging automobile, signal, or telephone batteries. They are made in three standard sizes of 10-, 30- and 50-ampere capacity and in direct current voltages ranging from 10 to 100 volts when operated at 110 volts alternating current, and from 20 to 175 volts when operated from 220 volts alternating current. Special rectifiers are furnished for higher direct current voltages than the foregoing from 220 volts alternating current and up to a maximum of 350 volts direct current, in capacities up to and including 50 amperes. Suitable for 60 cycles or more, although special rectifiers can be furnished for operation on 25, 30 or 40 cycles.



MERCURY ARC RECTIFIER

Tungar Battery Chargers—A popular charging device for garage or service station use is the Tungar battery charger. This charger is simple in construction, light in weight, self-starting, and requires no expert attendance. Its first cost and operating expense are very low. The smaller sizes can be connected to the lamp socket on any alternating current circuit. Descriptive bulletins are available as follows:

- 12-ampere 75-volt size, Booklet B3585;
- 6-ampere 75-volt size, Booklet B3487;
- 5-ampere 30-volt size, Booklet B3529;
- 5-ampere and 2-ampere 75-volt sizes, Booklet B3532A.



PORTABLE TUNGAR BATTERY CHARGER

WALL TYPE TUNGAR BATTERY CHARGER

Electric Rock Drills

Fort Wayne electric rock drills are extensively used in tunneling and mining operations. They are of the rotary hammer type, operated by a fully enclosed splash-proof electric motor. The drill steel rotates and receives about 1700 blows per minute. An adjustable belt tightener permits a wide variation in speed of the drill, which will drill holes up to 12 ft. in depth, finishing at $1\frac{1}{2}$ in. in diameter. The motor may be direct or alternating current, single-phase excepted, interchangeable mechanically. Power consumption is from $1\frac{1}{2}$ to $2\frac{1}{2}$ h. p. The drill can be handled by two men, the heaviest part weighing about 300 lbs. (Bulletin 48902.)

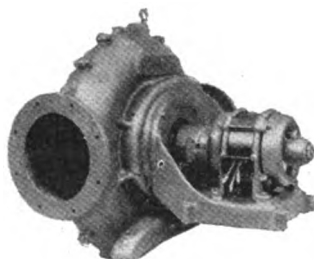


FORT WAYNE ELECTRIC ROCK DRILL IN OPERATION

Air Compressors and Blowers

Centrifugal Blowers—G-E centrifugal blowers or compressors are designed for large volumes and low pressures such as are required for the following classes of service: oil and gas burning furnaces, foundry cupola blowing, pneumatic mail and cash conveying systems, agitation of liquids, sewage treating plants, blowing water gas generators, etc. They are similar in design to the centrifugal pump and may be driven by direct current motors with auxiliary apparatus for starting and controlling speeds, induction motors for constant speed service, or by Curtis steam turbines. Blower and driver are direct connected, the complete unit requiring at most three bearings.

The G-E centrifugal blower differs from the ordin-

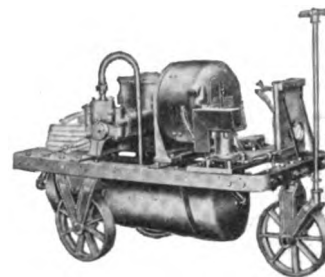


CENTRIFUGAL BLOWER WITH DIRECT CONNECTED INDUCTION MOTOR

ary fan blower in that it is provided with discharge or diffusion vanes which convert the otherwise lost energy of velocity into pressure energy, resulting in high over-all efficiency. It delivers practically constant pressure over a wide range of loads. The internal clearance is very large, thus there is no rubbing and no internal lubrication is required.

Made in various sizes. For general description send for Bulletin 48609; foundry applications, Bulletin 42800; gas plants, Bulletin 48600.

Reciprocating Compressors—The small G-E reciprocating compressors, such as are used to supply air brakes on electric railway cars, are particularly applicable for cleaning inaccessible parts of machinery in industrial plants, operating pneumatic tools, sand blasting, etc. These compressors are built in a combined unit with either induction motors or direct current motors of any commercial frequency or voltage.



PORTABLE AIR COMPRESSOR

They are furnished either portable or stationary, complete with automatic pressure governor, reservoir, line switch, fuses and pressure gage. (Bulletin 48610.)

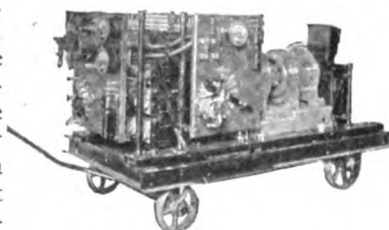
Electric Arc Welding Equipment

The use of welding apparatus by foundries, steel mills, shipyards and repair shops for the manufacture and repair of metal parts is rapidly increasing, due to the economies effected. The principal advantages of the electric arc welding process is that large amounts of energy are transformed into heat in a very small space, which reduces materially the expansion and contraction troubles and at the same time results in a high heat efficiency. The resulting extremely high temperature is sufficient to fuse the metal and it is not necessary in starting a weld to preheat or to bring the metal to the fusing temperature.

This Company has developed several types of arc welding equipment designed to meet almost every condition where it is possible to join metals by means of the electric arc.

Motor Generator Sets—The constant energy sets, primarily single-operator equipments, are designed for metallic electrode welding, but may be used intermittently for carbon electrode welding. This generator is usually furnished direct connected to standard induction motor, but it may be driven by any standard form of power.

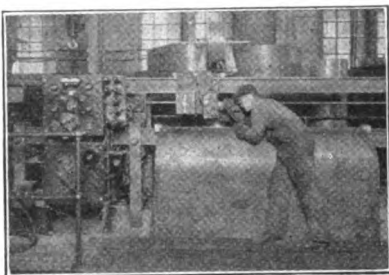
With the constant potential sets more than one welding circuit may be operated simultaneously without interference with each other. These generators built in ampere capacities of 400, 500 and 600 at 60 volts, and 800, 1000 and 1250 amperes at 75 volts, can also be furnished for drive by any suitable electric motor, engine or belt. They deliver a constant potential over the entire range of no-load to full-load. One or more operator panels may be supplied with each equipment to meet the service requirements. (Bulletin 48932A.)



CONSTANT POTENTIAL ARC WELDING SET

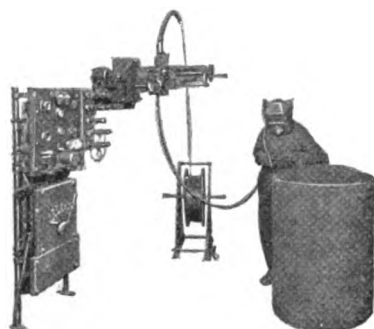
Automatic Arc Welder—This is a mechanical device to feed automatically a metallic electrode to the work and maintain a constant arc length and constant welding temperature. It is for use on direct current circuits only, and may be operated from any of the constant energy or constant potential generators above mentioned or from any constant potential direct current source of power.

This apparatus is especially applicable for routine, duplicate welding of pipe or tank seams; worn or undercut surfaces of shafts, axles and plates. It eliminates the unsteady conditions incident to hand manipulation of the electrode and makes a better weld in 20% to 50% of the time required by hand. (Booklet B3575.)



AUTOMATIC WELDER AS APPLIED TO WELDING TANK SEAMS

Semiautomatic Welding Lead—This apparatus is for use with the automatic welder described above to accomplish continuous welding and still permit the operator to direct the arc as required by the conditions of the work. It consists of a welding tool, held by the operator, which acts as a guide for the electrode wire, and with a handle providing a switch for operating the control panel of the automatic welder.

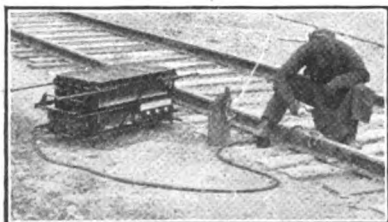


SEMI-AUTOMATIC WELDING

The field of application is welding seams of irregular contour, or large work where the travel mechanism and clamping necessary with the full automatic type would be costly or impracticable. The semiautomatic welder can be used also for rapidly filling up blowholes in castings or building up worn spots, etc. (Bulletin 68909.)

Resistance Type Welder—Strength, durability and low cost of operation are some of the qualifications of the type AW Resistor arc welder, specially designed for the welding of rail bonds, fish plates, etc., where it is not practicable to operate the more efficient outfits. In mines, or on electric railways, where it can be hooked to a trolley wire, this equipment can be carried easily to the job which your welder can do in quick time at a minimum cost.

The unit is light in weight—the 200-275 volt welder, 60 lbs.; the 400-650 volt welder, 140 lbs. Handles, conveniently placed, make it easy for the workmen to carry. Exposure to the weather will not injure the insulation or the resistance wire. (Bulletin 68902.)



G-E RESISTANCE WELDER BEING USED FOR RAIL BONDING

Accessories—Electrode holders for both metallic and carbon electrodes, extra flexible cable for attaching to electrode holders, face masks and head shields may also be supplied on short notice.

Electric Industrial Heating

The GENERAL ELECTRIC COMPANY is constantly developing new types of equipment, necessitated by the rapid advance in the utilization of electric heat in industrial operations. G-E industrial heating apparatus is being successfully applied in many different processes. Engineers designing installations in which electric heating equipment can be used should avail themselves of accumulated knowledge and experience in this line.

The following are a few of the numerous operations which have been simplified or improved by the adoption of electric heating with automatic temperature control:

Annealing copper, brass, nickel steels, and glass.

Baking japan, enamel, foundry cores, grinding wheels, insulation and furnace lining.

Drying chemicals, salts, food products, paints, varnishes, acid-washed metals, brake lining, crucibles and steel wire.

Heat treating carbon, nickel and high speed steels.

Heating rivets, glue, oils and compounds.

Melting brass, copper, aluminum, non-ferrous metals, lead and tin alloys, pitch, paraffin and compounds.

Sherardizing (rustproofing) metal parts.

Vulcanizing tires.

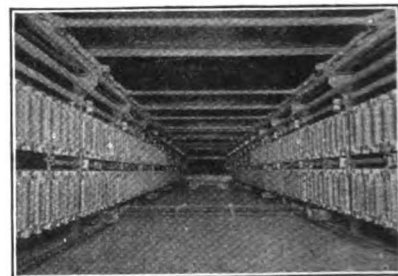
Electric Oven Equipment—Electrically heated ovens are economical; they permit close control of temperature and even distribution of heat; and they insure a uniform product and high quality of finish—results which can not be attained in the same degree with other means of heating. Electric ovens are also clean and easy to operate and they reduce fire hazard materially.

In many processes they are used in conjunction with continuous, electrically operated conveyors which move the charges in and out of the oven according to requirements and facilitate handling. Conveyor-type ovens are extensively used for heat treating glassware and steel, drying clay products and enameled ware, baking japan, and roasting a variety of products ranging from ores to foods.

The GENERAL ELECTRIC COMPANY makes various types of oven heaters and also panels for automatic control, direct and alternating current, single-phase or 3-phase. The heaters are made for wall, floor, and for either wall or floor mounting, and in capacities from 1.3 kw. to 12.3 kw., up to 600 volts. These give temperatures up to 950° Fahr. in the oven. (Bulletin 48021A.)

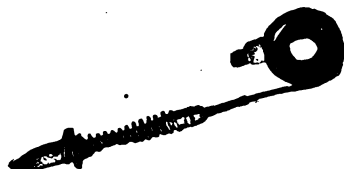
Electric Soldering Apparatus—For light or intermittent work, the electric soldering iron is one of the most useful of electrically heated devices for industrial purposes. G-E soldering irons are made in various sizes. (Booklet B3571.)

For moderate and heavy duty work, it is frequently desirable to use the ordinary soldering copper which must be heated in a furnace or open flame. Appreciating that fuel fired furnaces have many disadvantages, such as noxious fumes, excessive heat, a high fire risk, etc., an

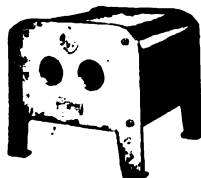


CONTINUOUS CONVEYOR TYPE JANNANNING OVEN

electrically heated 2-compartment muffle furnace for this purpose has been developed. It is made in 2 sizes: 1500 watts, suitable for irons up to 2½ lbs. per muffle, and 2000 watts for heavier irons. A 3-way switch provides 3 heats on 110 volts. On 220 volts, the furnace can be operated only on one heat, as both the muffles are in series. (Bulletin 69702.)



ELECTRIC SOLDERING IRON



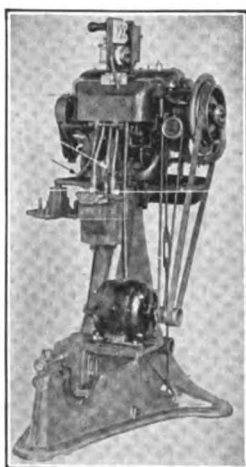
SOLDERING IRON FURNACE

Electric Sherardizing Machines—Metal to be rendered non-corrosive is sherardized by being electrically heated in the presence of zinc. In order to secure the best results and obtain uniformity as well as durability of coating, it is necessary to have unvarying quality of zinc dust and to maintain a certain correlation between the composition of this dust and the sherardizing temperature. Electric heat is ideal for this purpose, as the temperature can be maintained with absolute certainty. Articles so coated may be bent, swaged or otherwise deformed at ordinary room temperature without injury to the coating. (Bulletin 48926.)



ELECTRIC SHERARDIZING MACHINE

Cartridge Heating Units—For concentrated or localized heating, G-E cartridge units provide a more efficient method of heating than gas or steam, either of which require extensive piping and considerable attention to maintain correct heating. G-E cartridge units can be furnished for operation on any commercial voltages, from 100 to 250 volts. They are now being used extensively in many process machines, such as shoe, cigarette and paper box machinery, and for heating glue pots, soldering irons, moulds, etc. The unit is easily installed in a hole drilled in the casting or part to be heated. (Bulletin 69704.)



G-E CARTRIDGE UNITS ON SHOE MACHINE

Metal Melting Pots—The G-E self-regulating metal melter for melting lead, babbitt and similar metals, provides automatic regulation of temperature. This has been obtained by making the heating element of wire with a positive temperature coefficient, i. e., when the temperature of the heating element rises, its resistance rises proportionately and limits the current. When cold metal is put into the container, it is melted quickly by the initial rise of current, after which the current automatically decreases to a value just sufficient to keep the metal molten. (Bulletin 69703.)



30 LB. ELECTRIC METAL MELTER

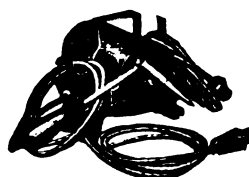
Electric Glue Pots—G-E electric glue pots are being widely and successfully used in wood shops, binderies, etc. The water jacketed type is recommended where glue is used intermittently, as it permits the use of a high starting heat to melt the glue quickly. The jacketless type for continuous service automatically maintains the correct working temperature and operates on about one-half the current required for the average jacketed pot. (Bulletin 69100.)



WATER JACKETED GLUE POT

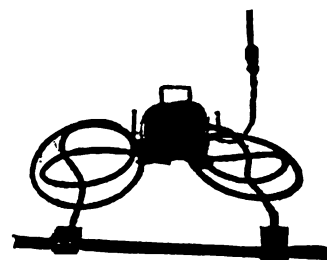
Industrial Kettles—The GENERAL ELECTRIC COMPANY is prepared to furnish heating equipment for kettles and tanks for heating various substances such as oil, paraffin, solutions, compounds, etc., where the purchaser provides the tank and foundation and installs the heating equipment.

Electric Lead Burners—The G-E "Pyrotip" electric lead burner is a transformer designed to be connected to the ordinary 110-volt alternating current circuit. It is used for burning terminals in place on storage batteries, removing old connections, cutting off or building up posts and, in fact, almost any kind of soldering work. The current required is about the same as that drawn by a flat iron. (Booklet 3586.)



"PYROTIP" ELECTRIC LEAD BURNER

Electric Pipe Thawers—The G-E Wayne pipe thawer is essentially a transformer which reduces voltage of the lighting circuit and draws sufficient current to thaw small pipes. It is for use on 110 to 125 volts A.-C., 50 to 60 cycles. It eliminates fire hazard incident to the use of a blowtorch inside of buildings and is a good addition to plumbing establishment in cold climates.

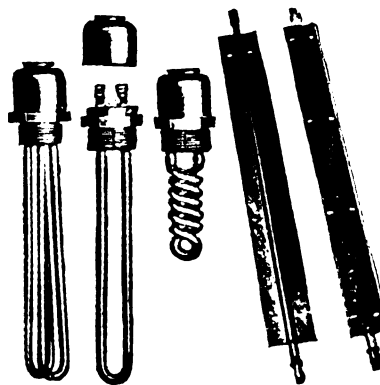


TRANSFORMER CONNECTED TO FROZEN PIPE

Sheath Wire Heating Units—Helical core sheath wire consists of a heating element in the form of a helical core of calorite wire held firmly in place in a metal tube by a filler of powdered insulating material giving a compact unit of great mechanical strength.

Units made of this wire are ideal for localized heating. They concentrate heat where it is needed and are adaptable where other heat sources can not be applied.

Three forms of heating units have been developed: an air heating unit equipped with radiating vanes; a clamp-on unit adapted to warming tables, glue troughs, plates on process machines and other flat metal surfaces; and the

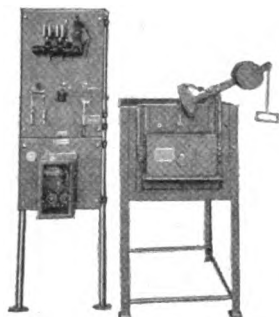


G-E SHEATH WIRE HEATING UNITS

adapted to warming tables, glue troughs, plates on process machines and other flat metal surfaces; and the

immersion heater, made in several styles, for heating water, oil or other liquids in kettles, tanks, metal barrels, etc. (Bulletins 69708 and 69709.)

Electrical Heat Treating—Some of the advantages of electrically equipped and controlled heat treating furnaces are: automatic control of the temperature, giving minimum temperature variation in the furnace; maximum rate of heating the charge; maximum efficiency in heat treating and elimination of scale due to oxidation. Heat treating problems should be referred to the industrial heating specialists located in the nearest G-E Sales Office. See page 728.



G-E SEMICYLINDRICAL FURNACE

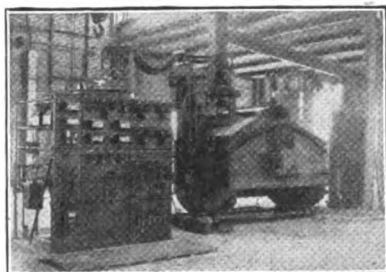
Heat Treating Furnaces

—To overcome objections that have been made to small electric heat treating furnaces, especially as regards time of heating and flexibility of temperature control, a new automatic furnace was developed recently known as the semicylindrical type. This furnace, possessing several improved features, can be operated at 2000° Fahr. The complete equipment includes transformer, automatic control panel and temperature control instrument mounted on the panel.

Heat Treating Furnace Equipment—For existing heat treating furnaces using temperatures from 900° to 1800° Fahr. such as hardening, drawing and annealing carbon steel, drawing high speed steel, annealing brass and copper, and baking vitreous enamels, this Company has developed electric heating equipment with automatic temperature control. This includes electrical equipment only, furnace structure to be provided by purchaser. (Bulletin 69705.)

Oil Tempering Baths—The G-E oil tempering bath for tempering carbon steels is safe, efficient, and easy to operate. It is made in different sizes, heats up very quickly and can be held at any temperature. (Bulletin 69700.)

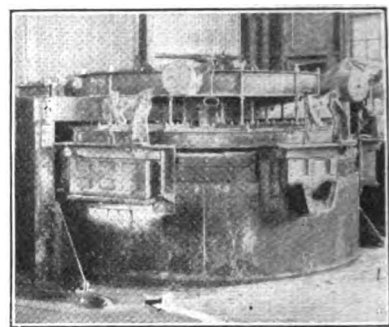
Electric Melting Furnaces—For melting non-ferrous metals and alloys, the G-E electric furnace is very efficient and economical and the highest quality of product can be secured with a minimum loss of volatile alloys. With its use working conditions are vastly superior to those where fuel-fired furnaces are used. This furnace is furnished complete with motor operated electrode and tilting mechanisms, and all electrical accessories. Electric current may be taken from either a 2-phase or 3-phase line. (Bulletin 68700.)



G-E ELECTRIC BRASS MELTING FURNACE AND CONTROL

The G-E induction furnace is essentially a transformer in which the entire energy transferred to the secondary circuit is absorbed therein in the form of heat. The secondary circuit consists of a ring of the metal which is to be heated or melted. The principal field of application for this type of furnace is the refining of

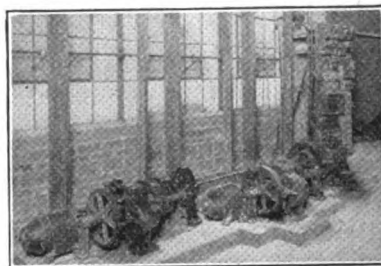
steel, cast iron and malleable iron of high quality. Other uses are the reclamation of expensive alloy steels, and the melting of ferromanganese preparatory to alloying steel in the liquid state. In regular production of special steel one of these furnaces poured a 1-ton ingot every 4 hours (approximately) for 555 consecutive heats before it was necessary to reline it.



4000-LB. INDUCTION FURNACE

Arc Furnace Equipment—The GENERAL ELECTRIC COMPANY can supply all the electrical equipment needed in connection with any type of electrical arc furnace, including such specialties as automatic electrode regulators, motor operated multiple pole switches, voltage reactances, etc.

Designers of furnaces for reduction of ores, for production of abrasives, production of ferro-alloys, steel, electrolysis of fused salts, fused silica products, carbon bisulphide, calcium carbide, fixation of atmospheric nitrogen, and a multitude of other electrothermic developments, will find the Company's experience in this line of value. G-E furnace specialists will co-operate in the proper design of furnaces from the electrical engineering point of view, advising as to all the latest improvements in electrical equipment and as to the best utilization of the sources of energy at your disposal. (Bulletin 48710B.)



G-E EQUIPMENT OPERATING CALCIUM CARBIDE FURNACE ELECTRODES

Electric Rivet Heaters—This equipment has been designed to give industries an economical method of heating rivets, particularly structural iron and similar work which requires a steady uniform demand of hot rivets. Power consumption varies from 17 to 20 kw.-hr. per hundred pounds of rivets, depending on the size and composition of the rivets. Advantages over fuel-fired furnaces are: greater portability, less fire hazard, economy in power used, and through successful heating. (Bulletin 69701A.)

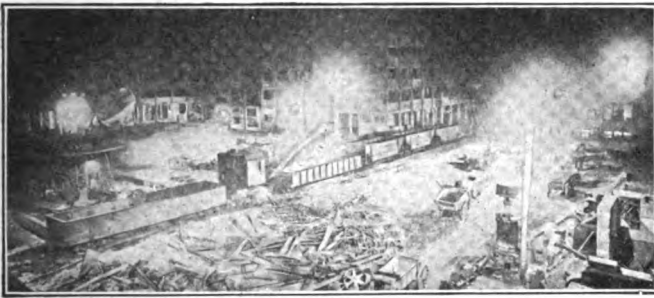


ELECTRIC RIVET HEATER

Industrial Lighting Equipment

Floodlighting Projectors—G-E floodlighting projectors are extensively used in lighting arsenals, building fronts, chimneys, docks, freight unloading, grain elevators, manufacturing plant exteriors, patrol duty, quarries, water tanks, theater fronts, railroad yards, etc. As silent watchmen, they protect property since adequate illumination is good burglar insurance.

G-E projectors are designed for use near the object, for long range, or for lighting large areas as shown. All projectors are equipped with focusing mechanisms to regulate divergence of the beam. (Bulletin 43850B.)

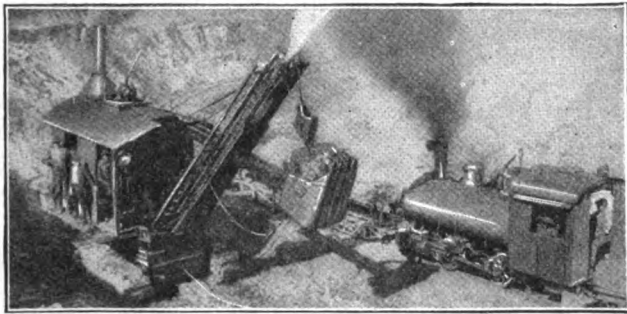


CONSTRUCTION WORK ILLUMINATED BY FLOOD LIGHTING PROJECTORS

Headlight Turbine Generator Sets—To meet the rigid requirements of steam locomotive headlight service, a 500-watt turbine generator set has been designed especially to supply power for the headlight and cab lights.

Its use has been extended to other applications including steam shovels, derricks, wrecking cranes, oil well drilling outfits, launches and tugboats. This set consists of a single-stage Curtis steam turbine direct connected to a compound-wound generator which delivers energy at practically constant voltage under different loads.

For industrial applications, the set is made for operation on 70- to 170-lb. boiler pressure, supplying 110 volts; for locomotive headlight service, it is made for operation on 125- and 225-lb. boiler pressure at 32 volts. Parts are interchangeable so that sets of either voltage can be furnished to operate on either range of boiler pressure. (Bulletin 82014B.)



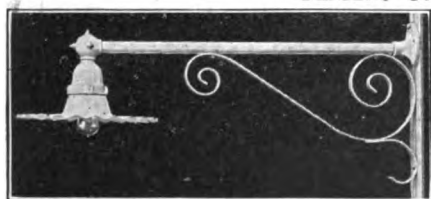
TURBINE GENERATOR SET ON LOCOMOTIVE AND STEAM SHOVEL SUPPLYING CURRENT FOR FLOODLIGHTS

Electric Headlights—G-E headlights can be furnished for electric railways, both traction service and mining or other industrial locomotives, also for steam roads. The arc type is described in Bulletin A4061; incandescent type in Bulletin 43800.

Lighting Fixtures—Novalux pendent and ornamental units are designed for use with the efficient Mazda



PENDENT UNIT



INCANDESCENT BRACKET, CONCEALED WIRING



ORNAMENTAL UNIT

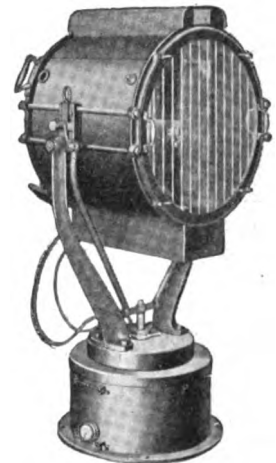
“C” lamp. The pendent type is particularly suited for the illumination of streets, large interiors and exteriors. The different light directing equipments produce such a variety of illuminating characteristics that a selection can be made to meet any individual requirement.

The ornamental units, in addition to lighting the streets and sidewalks, are designed to throw considerable light upward to illuminate the building fronts. By combining illuminating efficiency with a dignified and distinctive appearance, they beautify their surroundings and are an asset by day as well as by night. They are made for all standard lighting circuits and for all candlepowers. (Bulletin 43503B.)

Electric Searchlights—Searchlights are suitable for night work in mines, railroad yards, marine and construction work.

This Company makes 2 types: an 18-in. incandescent lamp, 1000-watt, 110-volt searchlight; and the arc lamp type in sizes 9, 13, 18 and 24 in. Larger projectors of 30, 36 and 60 in. in diameter are manufactured and can be supplied. All have silvered glass mirrors, are entirely automatic, require minimum of attention and are quiet in operation.

Projectors arranged for hand and pilot house control are regularly kept in stock for immediate shipment. Units for shaft, rope, and electrical control can be provided when desired. (Bulletin 43856A.)



ELECTRICALLY CONTROLLED SEARCHLIGHT

Highway Lighting Units

—With the constantly increasing night traffic, the necessity of some form of highway illumination, at least for congested sections and at danger points, becomes more and more apparent. The new G-E Novalux highway lighting unit provides a feasible and inexpensive solution of the problem.

This new unit consists of small reflectors so shaped and assembled that they do the work of an ordinary reflector 15 ft. in diameter. It projects the full beam of light directly on the roadway without waste of illumination on adjoining areas. Excellent illumination



ROAD ILLUMINATED WITH NEW HIGHWAY UNITS

can be obtained by spacing these units about 300 ft. apart and using 250-c.p. lamps, and very good results can be obtained with spacings up to 600 ft. Larger lamps can be used if more light is desired.

If the highway is properly lighted, headlight glare is less noticeable and it is possible to drive with headlights dimmed, which is an advance toward greater safety. (Booklet B3629.)

Street Lighting Systems—This company can supply equipment for complete street lighting systems for arc lamps or MAZDA lamps.

Constant current transformers for use with series incandescent systems are built in capacities from 1 to 80 kw., inclusive, which may be supplied for any commercial voltage, frequency and current. (Bulletins 65109A and 65110A.)

Series luminous rectifier outfits for operating series magnetite arc lamps are described in Bulletins 43253 and 43900.

A repeating type magazine film cut-out is available with standard G-E series sockets, which gives fifteen new dielectric surfaces from each roll. The film roll is enclosed in a highly insulated capsule, making it moistureproof and heatproof, and permits it to be placed in the linemen's pockets without causing any damage to the dielectric surface of the film.

Blue Printing Lamps

Economical blue printing and photographic work requires an intense light containing an excess of violet, ultraviolet or actinic rays. It is desirable to use an arc lamp having a high current adjustment.

The GENERAL ELECTRIC COMPANY manufactures a special enclosed carbon arc lamp meeting these requirements. These are adjusted for 20 amperes at 110 volts A. C., 15 amperes at 220 volts A. C., and 10 amperes at 220 volts D. C. All are equipped with heat resisting globes.

Color Matching Outfits

This equipment satisfies the demand for a low priced illuminant that will show colors in their true values. It is used in dyeing and finishing plants, dyestuff plants, textile mills, printing ink factories, chemical plants, paper mills, and general testing and research laboratories. It furnishes practically the same light as comes from a clear north sky, and thus enables many processes to run continuously that formerly could only be run in the daytime under favorable weather conditions.

Electrical Precipitation Equipment

The Cottrell electrical precipitation process has found several applications, particularly in chemical industries, such as recovering and collecting fumes and dust from gases, recovering tar and oils, and cleaning the air drawn from buildings. The electrical equipment for this process is of very special type. The GENERAL ELECTRIC COMPANY can furnish all of this electrical equipment, described in Bulletin 49137.

Electrically Operated Valves

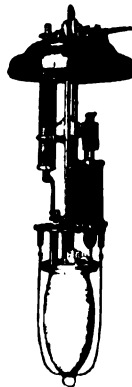
For the remote or automatic control of liquids or gases under pressure. Suitable for operating steam or air whistles, controlling the application of brakes operated by compressed air or oil, such as are used on large hoists, controlling the flow of fuel fluids to furnaces, etc. These valves may be operated from a distance by means of accessories such as a snap switch, float switch, thermostat or push button station.



CR9501 SOLENOID VALVE



OUTDOOR AND STATION TYPE TRANSFORMERS FOR SERIES INCANDESCENT SYSTEMS



BLUE PRINTING LAMP

Insulating Materials

Insulating materials manufactured by the GENERAL ELECTRIC COMPANY are developed from careful research and made primarily to meet the requirements of G-E products. They represent years of experience in the manufacture of insulating fabrics and compounds. These same materials are offered to others for general electrical repair work.

The insulating compounds include varnishes, japans, oils, sealing compounds and paints. The fabrics, including fibers and papers treated with varnishes, oils and japans, and also asbestos tape and treated cloths are described in Bulletin 48715.

Fabroil Gears

Because of their noiseless operation, long life and high tooth strength, Fabroil gears are applicable to lathes, planers, traveling cranes, drill presses, shears, punches, etc.; shafts of back geared motors which drive machine tools; drive of spinning frames in silk, worsted, carpet and similar mills; heavy machinery or paper and pulp mills; intricate mechanism of printing plants; automobile and other gas engine ignition drives; timing gear-trains. While in some instances they run with success at 4000 ft. per minute, maximum speed should be kept at 2000 ft. per minute for all general applications.



FINISHED FABROIL GEAR

Fabroil gears are made from 1 in. in diameter to sizes for transmitting hundreds of horsepower. They are strong as the best cast iron; unaffected by atmospheric changes and extreme dryness or dampness; they run equally well against cast iron, steel or bronze; can be run in cold or hot oil baths; and are absolutely verminproof.

Electric Fans

Motor Driven Exhaust Fans—These outfits are self-contained units, adapted for ventilating shops, factories, office buildings, etc. for use in dye houses, laundries, paper mills and other industrial establishments where it is desirable to remove steam, moist air, dust, smoke and odors, or to exhaust noxious gases and fumes which attend certain processes of manufacturing. These outfits may also be usefully employed to dry cloth, paper, wool, tobacco, asbestos, bricks, clay and many other articles.

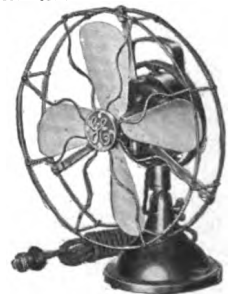
Made in disk and propeller types for both alternating and direct current, standard voltages. Sizes range from 12½ to 48 in. in diameter; capacities from 750 to 25,900 cu. ft. of air per minute.

Cooling Fans—G-E standard alternating and direct current fans are made with four blades, oscillating or non-oscillating, in 9-in., 12-in., and 16-in. sizes. They are wound for voltages of 110 and 220 at 25, 40, 50 and 60 cycles. Direct current voltages of 32, 110 and 220.

Ceiling fans are made in 52- and 32-in. sizes for use on either alternating or direct current.



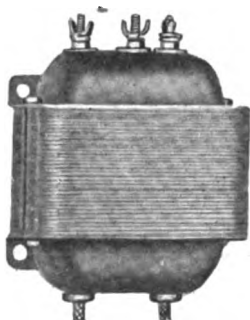
DISK FAN



G-E ELECTRIC FAN

Bell Ringing Transformers

G-E Wayne bell ringing transformers are inexpensive, easy to install, consume a very small amount of current and last indefinitely. The heavy duty sizes, 50 and 100 watts, are used for operating signal systems requiring considerable power, such as in clubs, hotels, fire stations, factories and mines. They cannot be put out of order through carelessness or mischief. (Booklet B3572.)



"WAYNE" BELL RINGING TRANSFORMER

G-E Reliable Wiring Devices

It is manifestly impossible to list more than a few of the 3000 wiring devices made by the GENERAL ELECTRIC COMPANY. Some of those having especially industrial uses are shown here; for information on the complete line, send for G-E Specialties Catalogue Y1270.

Locking Sockets and Receptacles—Locking sockets afford a positive protection to lamps installed in public or semipublic places. They also prevent the theft of current through the surreptitious use of high wattage lamps and current consuming devices. When the key is removed, the screw shell of the socket swivels freely, preventing injury either to the lamp base or socket if an attempt be made to remove the lamp without the use of the key. G-E locking sockets can be furnished in key, keyless and pull, metal shell and porcelain types with all the usual styles of caps and bases.



LOCKING SOCKET

Locking receptacles are made in several types, moulding, cleat, conduit box, etc., porcelain or with metal shells.

Threaded Catch Sockets—The G-E threaded catch socket can not pull apart under many times the strain to which it will be subjected in service. Its strength and rigidity are unequalled by any other design of metal lamp socket. Lugs on the cap fit into the body of the shell, preventing twisting, and a threaded ring holds the two parts of the shell firmly together.

This improved design costs no more than the ordinary types. It is made in key, keyless and pull styles, also in the locking type, both key and keyless. It is not designed for use in fixture husks.

Porcelain Sockets and Receptacles—For outdoor installation or where sockets are exposed to unusual dampness or other corrosive influence, G-E weatherproof sockets should be used. Made N. E. C. standard and will take standard weatherproof shade holders.

G-E porcelain cleat receptacles are unique for good appearance, utility and dependability. The mechanism is protected from dampness and dust. Made N. E. C. standard in key and keyless types, solid and removable base.



CLEAT RECEPTACLE REMOVABLE BASE



WEATHER-PROOF SOCKET

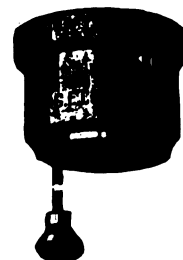
G-E porcelain moulding receptacles are sturdy and neat appearing. Made in key and keyless types. The conduit box receptacles are made to fit 3 1/4- and 4-in. conduit boxes. Made key and keyless.

Convenience Outlets—"Standard" convenience outlets recommended for general use. Made in single and twin outlet types. These convenience outlets take the same outlet boxes as flush push button switches. Provided with "standard" plugs, also heavy duty receptacles, 25 amperes, for use on heating circuits, etc.



MOULDING ROSETTE

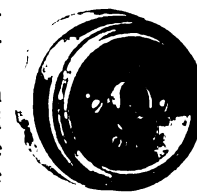
Pull Switches—A necessary convenience where lights are inaccessible or remote from point of control. These G-E devices are well made and electrically perfect. Made for cleat and conduit work and with 1- or 2-way bases. Provided with short chain and 10 ft. of cord.



CEILING SNAP SWITCH, CONCEALED BASE

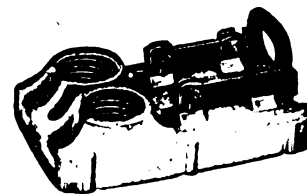
Snap Switches—Admirably adapted for wiring in attics, garages, cellars, barns, storehouses and in all installations demanding a low cost, yet thoroughly dependable switch. Made with porcelain base and all porcelain, in all standard ratings, in a great variety of types and sizes and indicating or non-indicating forms.

The tumbler switch made in flush and surface types, is ideal for all classes of buildings. It combines the usual two push buttons into a single lever that operates (up and down at the slightest touch). Porcelain switches are recommended for use in places subject to moisture, acid fumes or other corroding influences. Made for cleat, moulding and conduit work, single, 2-, 3- and 4-way.



PONY TYPE TUMBLER SWITCH

Plug Cut-outs—Made with porcelain base, single, double and triple pole, 2- or 3-wire and mounted separately and with switch on common base. Furnished in 30- and 60-ampere capacities.



COMBINED SWITCH AND PLUG CUT-OUT

Fuses—Where maximum protection under all conditions is desired the use of N. E. C. S. indicating fuses is strongly recommended. Where it is considered desirable on account of frequent blowouts to use fuses of the renewable type, G-E renewable enclosed fuses N. E. C. S. are offered with the assurance that they embody all the best features of this type of fuse.



FUSE PLUG



ENCLOSED FUSES

WESTINGHOUSE ELECTRIC & MFG. CO.

Manufacturers of Apparatus for the Generation, Application, and Control of
Electric Power

EAST PITTSBURGH, PA.

DISTRICT OFFICES

ALBANY, N. Y., Journal Bldg.
ATLANTA, GA., Candler Bldg., 127 Peachtree St.
BALTIMORE, MD., Westinghouse Bldg., 121 E. Baltimore St.
BIRMINGHAM, ALA., Brown-Marx Bldg., First Ave. and Twentieth St.
BLUEFIELD, W. VA., Law and Commerce Bldg., Federal and Radcliff Sts.
BOSTON, MASS., Rice Bldg., 10 High St.
BUFFALO, N. Y., Ellicott Square Bldg., Ellicott Sq.
BUTTE, MONT., Montana Electric Co. Bldg., 52 E. Broadway
CHARLESTON, W. VA., Kanawha National Bank Bldg., Capitol and Virginia Sts.
CHARLOTTE, N. C., Commercial Bank Bldg., Rooms 409-411
CHATTANOOGA, TENN., Hamilton National Bank Bldg., 701 Market St.
CHICAGO, ILL., Conway Building, 111 W. Washington St.
CINCINNATI, OHIO, Westinghouse Bldg., Third and Elm Sts.
CLEVELAND, OHIO, Sweetland Bldg., 1010 Euclid Ave.
COLUMBUS, OHIO, Interurban Terminal Bldg., Third and Rich Sts.
DALLAS, TEX., Exchange Bldg., Akard and Wood Sts.
DAYTON, OHIO, Reibold Bldg., S. Main St.
DENVER, COLO., Gas and Electric Bldg., 910 Fifteenth St.
DES MOINES, IOWA, 608 Securities Bldg., 412 W. Seventh St.
DETROIT, MICH., Dime Savings Bank Bldg., Fort and Griswold Sts.
DULUTH, MINN., Alworth Bldg., 306 W. Superior St.
EL PASO, TEX., Mills Building, Oregon and Mills Sts.
FRESNO, CAL., J and Mariposa Sts.
HOUSTON, TEX., Union National Bank, Bldg., Main and Congress Sts.
INDIANAPOLIS, IND., Traction Terminal Bldg., Illinois and Market Sts.
JACKSONVILLE, FLA., Union Terminal Warehouse, E. Union and Ionia Sts.
KANSAS CITY, MO., Orear-Leslie Bldg., 1012 Baltimore Ave.
LOUISVILLE, KY., Paul Jones Bldg., 312 Fourth Ave.
LOS ANGELES, CAL., I. N. Van Nuys Bldg., Seventh and Spring Sts.
MEMPHIS, TENN., Exchange Bldg., 6 N. Second St.
MILWAUKEE, WIS., First National Bank Bldg., 425 E. Water St.
MINNEAPOLIS, MINN., Metropolitan Life Insurance Bldg., 119-131 S. Third St.
NEW ORLEANS, LA., Maison Blanche Bldg., 921 Canal St.
NEW YORK, N. Y., City Investing Bldg., 165 Broadway
NIAGARA FALLS, N. Y., 205 Falls St.
PHILADELPHIA, PA., Widener Bldg., 1325-1329 Chestnut St.
PITTSBURGH, PA., Union Bank Bldg., 306 Wood St.
PORTLAND, ORE., Northwestern Bank Bldg., Broadway and Morrison Sts.
ROCHESTER, N. Y., Chamber of Commerce Bldg., 119 E. Main St.
ST. LOUIS, MO., 300 N. Broadway
SALT LAKE CITY, UTAH, Walker Bank Bldg., Second St., South and Main Sts.
SAN FRANCISCO, CAL., First National Bank Bldg., 1 Montgomery St.
SEATTLE, WASH., Westinghouse Bldg., W. Spokane St. and E. Marginal Way
SYRACUSE, N. Y., University Bldg., 120 Vanderbilt Sq.
TOLEDO, OHIO, Ohio Bldg., Madison Ave. and Superior St.
TUCSON, ARIZ., Immigration Bldg., 90 Church St.
WASHINGTON, D. C., *Higgs Bldg., 723 Fifteenth St., N. W.
WILKES-BARRE, PA., Miner's Bank Bldg., W. Market and Franklin Sts.
HONOLULU, T. H., The Hawaiian Electric Company, Ltd., Agent
*Government business exclusively.

WESTINGHOUSE SERVICE SHOPS

ATLANTA, GA., Cor. Markham and Man-
gum Sts.
BALTIMORE, MD., 501 E. Preston St.
BOSTON, MASS., 12 Farnsworth St.
BUFFALO, N. Y., 141-157 Milton St.
CHICAGO, ILL., 32 S. Peoria St.
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CLEVELAND, OHIO 1255 W. Fourth St.
DENVER, COLO., 1909-15 Blake St.
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LOS ANGELES, CAL., 2019 Bay St.
NEW YORK, N. Y., 467 Tenth Ave.
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PITTSBURGH, PA., 6905 Susquehanna St.
ST. LOUIS, MO., 1906 Pine St.
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St., S
SAN FRANCISCO, CAL., 1400 Fourth St.
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LONDON OFFICE: No. 2 Norfolk Street, Strand

MAIN WORKS: EAST PITTSBURGH, PA.

CUBA OFFICE: Edificio Banco Nacional de Cuba, Havana

ARGENTINE

Cia. Westinghouse Electric Internacional, S. A., Maipu 73, Buenos Aires

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Nolan Smith & Co., 16 Carrington St., Sydney, N. S. W. (Miniature Lamp Agents Only)

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NEW YORK, 141 Broadway

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Errazuriz, Simpson & Co., Huerfanos, 1112 Santiago
BRANCH OFFICE: Prat esq. Washington, Antofagasta
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CHINA

Westinghouse Electric International Co., Asiatic Petroleum Company's Bldg., No. 1 The Bund, P. O. No. 690, American Post Office, Shanghai

COLOMBIA

Vicente B. Villa & Co., 178 Palace, Medellin
NEW YORK, 165 Broadway

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H. T. Purdy, Altos del Banco de Costa Rica, San Jose
NEW YORK, Wonham, Bates & Goode Trading Corp., 251 Fourth Avenue

FRANCE, her Colonies and Dependencies

Compagnie Electro-Mecanique, 12 Rue Portalis, Paris

GREAT BRITAIN, her Colonies, Dependencies, and Protectorates other than in North America

Metropolitan Vickers Electrical Export Co., Ltd., 4 Central Buildings, Westminster, S. W. 1, London

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INDIA

Consolidated Agencies, 21 Old Court House St., Calcutta
BRANCH OFFICES (Lamp Agents Only): Federated Malay States and Dutch East Indies

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JAPAN

Takata & Co., No. 2 Yeuraku-cho-Nichome, Tokyo
BRANCH OFFICES: Yokosuka, Kure, Taipeh, Hokodate, Moji, Saseho, Nagasaki, Kobe, Nagoya, Nagaoka, Osaka, Maizuru, Yokohama, Dalny, Seoul.

NEW YORK, 50 Church Street

MEXICO

Cia. Westinghouse Electric Internacional, 16 de Septiembre No. 58, Apartado No. 78-Bis Mexico City, D. F.

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Emilio Wagner y. Cia., Calle de Coca, 492-498 Lima

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Clatton-Neill Engineering & Machinery Co., 25 Santa Cruz Bridge, Manila

NEW YORK, Alexander & Baldwin, Ltd., 82 Wall Street

PORTO RICO

Porto Rico Railway, Light & Power Co., San Juan
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Wm. C. McEntee, Santa Ana

SPAIN

Sociedad Espanola de Construcción Naval, Lealtad 8, Madrid

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Foreword

Westinghouse has always been a pioneer in the design and manufacture of electrical apparatus. Its organization contains many of the country's foremost electrical engineers together with a staff of mechanical and chemical engineers of exceptional ability.

Westinghouse is, therefore, able and willing to co-operate with the engineers of industrial plants by rendering advice and assistance and by furnishing any available information on the economic application of electricity to industry.

Westinghouse has unexcelled facilities not only for the manufacture of any number, kind or size of products, but also for exhaustive testing and research work without which there could be no progress.

Service

Westinghouse maintains service department repair shops in every part of the United States, not only to install its apparatus, but also to maintain this apparatus in its highest state of efficiency. This, together with the ability to furnish repair parts for that unexpected breakdown from any of these service stations, insures to users of Westinghouse products a service of inestimable value.

Stokers

It is generally conceded that the days of hand firing are numbered. The great variety of mechanical stokers put on the market in the last few years has enabled the combustion engineer to successfully burn almost any kind of coal under any size and number of boilers.

Under ordinary hand fired conditions, approximately 40% of the heat value of fuel is lost. With suitable stokers accurately designed and constructed, a fuel loss of 10% to 12% is rarely exceeded. The replacement of labor that this equipment effects adds to its economical and time saving advantage.

The economy of stoker operation therefore becomes at once apparent.

Although the stoker, furnace, boiler and stack may be of excellent design, they may not be of proper relative size or suited to each other or to the coal used and will therefore operate unsatisfactorily.

Westinghouse expert combustion engineers assist purchasers in designing their furnaces and boiler settings and instruct the operators in obtaining the highest economical results.

Underfeed Stokers—The Westinghouse underfeed stoker is of the multiple retort type designed and constructed to serve plants that require a wide range of economical operation or where peak loads and sudden increases in steam demands must be met.



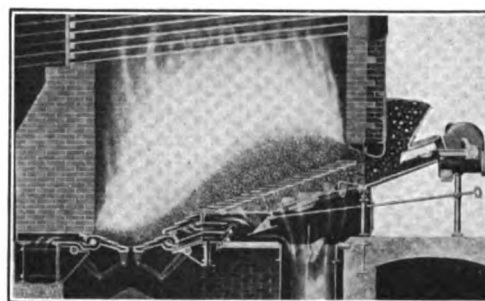
It has a reserve capacity of 250%, 300% or 400% of boiler rating when required.

It should be provided with ample combustion space, proper settings, large ash pits and underground air ducts. Forced draft is required for this type of stoker. The dampers may be quickly set, a long range of adjustment provided for, the usual air dilution is cut one-half and a high percentage of CO₂ is obtained in the flue gases.

Patented tuyeres insure proper admission and distribution of air to the underfeed section and corrugated overlapping and changeable grates provide proper admission of air to the overfeed section.

There is no waste, no idle equipment and no boilers held in readiness for peaks in plants equipped with the Westinghouse underfeed stoker.

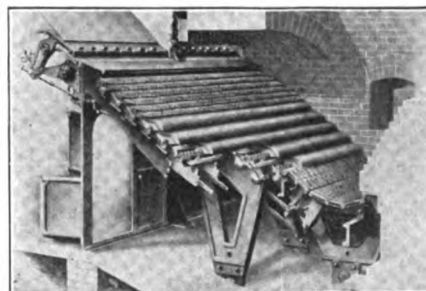
For full information, write for Circular 1615.



WESTINGHOUSE UNDERFEED STOKER IN ACTION

Overfeed Stokers—Conditions frequently exist in power plant design and operation that do not demand the high overload capacity nor the extreme flexibility that the Westinghouse underfeed stoker possesses.

The Westinghouse-Roney stoker very satisfactorily burns the high volatile coals found in the Middle West as well as the low ash coals used so largely in the East.



WESTINGHOUSE-RONEY OVERFEED STOKER

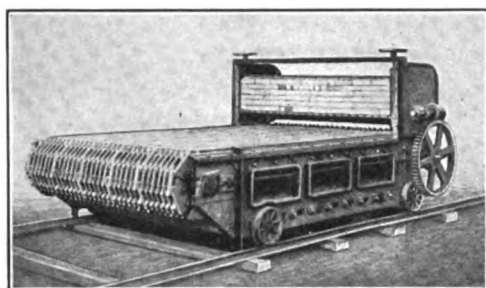
* Information will be furnished by nearest office.

Ashes can be removed to the boiler room floor, eliminating the necessity for expensive basements and ash pits.

When maximum reserve capacity is not over 200% rating, this type of stoker is widely used. It is particularly adapted to tubular boiler applications and to boilers generally found in moderate sized plants.

Full information is given in Circular 1616.

Chain Grate Stokers—The Westinghouse chain grate stoker is of the traveling grate, standard link type and is limited in its application. It is particularly adapted to coals found in Illinois and the West.



WESTINGHOUSE CHAIN GRATE STOKER

Steam Turbines

Electric power must first be cheaply generated and second, be absolutely dependable. Breakdowns during working hours cripple production and increase costs.

The turbine of today has ceased to be a machine of too high a speed for general application. It may be designed for its best speed and gear connected to the driven machine for performing all classes of work.

The advantages of steam turbine units are: Compactness, simplicity of construction, lower maintenance cost, high efficiency and little attention required.

Turbines for Mechanical Drive—This is the ideal turbine for driving centrifugal boiler feed pumps, circulating pumps, blowers and other mechanical apparatus.

These turbines are designed for reliability and simplicity and can be arranged either for driving by direct connection or through the medium of Westinghouse reduction gears. Capacities, 5 to 500 h.p.



WESTINGHOUSE TURBINE FOR MECHANICAL DRIVE

Important features of design of Westinghouse turbines are: A heavily reinforced steel forging for turbine rotor containing a single row of blades; bronze nozzle and brass reversing chamber; electric furnace, nickel-steel blades; powerful centrifugal type speed-regulating governor; water-sealed glands; balanced bronze inlet valve.

In capacities of 50 h.p. and upwards, the turbine casings are supported from the center instead of the usual turbine feet in order to insure perfect alignment of shaft under high temperatures. See Leaflet 3907A.

Reduction Gear

A dependable, efficient and noiseless method of

speed reduction on moderate capacities which can be used with any type of turbine or motor, for speed increase or decrease, is obtained by the Westinghouse reduction gear. With this type of gear, the highest efficiency of the turbine and operated machines may be obtained.

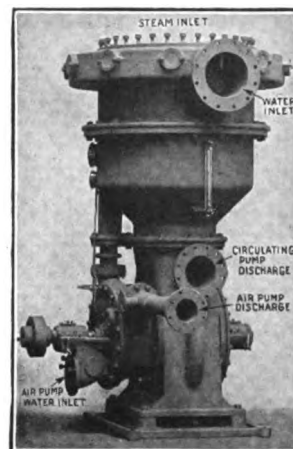
For further information, write for Leaflet 3904A.



WESTINGHOUSE REDUCTION GEAR FOR MODERATE CAPACITIES

Condensers

The highest efficiency in the operation of the steam turbine is obtained by allowing the exhaust steam to pass into a condenser. The governing points entering into a true operating cost may be summed up as (1) power required to operate pumps and the efficiency of turbine or motor driving them; (2) ability of the condenser to maintain a high vacuum continuously; (3) cost of keeping the condenser in operative condition.



WESTINGHOUSE-LEBLANC JET CONDENSER

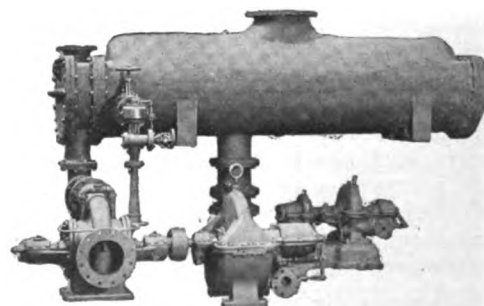
Jet Condensers—The Westinghouse-Leblanc jet condenser is capable of maintaining a high vacuum at low operating costs and is simple and compact. Its distinguishing feature is the absence of reciprocating parts and the fact that it has only 2 pumps, circulating and vacuum (both centrifugal), driven from the same shaft and adapted for low speeds.

For further information, write for Leaflet 3899.

Surface Condensers—The Westinghouse-Leblanc surface condenser is particularly designed so that the circulating water travels positively and rapidly past every square inch of the cooling surface, and is so constructed as to eliminate air and steam pockets, thus making for long life of the condenser.

It is also capable of maintaining a high vacuum and is known as the high vacuum condenser. In general, the apparatus consists of the condenser, a centrifugal pump and a Leblanc air pump. They are installed in plants all over the world and are built to serve turbines up to 100,000 h.p.

For further information, write for Leaflet 3894.



WESTINGHOUSE-LEBLANC SURFACE CONDENSER

Direct Current Generators

Westinghouse manufactures direct current generators in capacities from a fraction of a horsepower to 1000 h.p. in standard voltages for direct connection, turbine or belt drive.

Some of the more important types of these are described as follows:

Small Geared Turbine Generator Units—This small Westinghouse turbine comprises every refinement of design for safety and successful operation contained in a large turbine or reciprocating engine. It is designed for steam at boiler pressures ranging from 75 to 250 lbs. for condensing and non-condensing service. It is used with Westinghouse standard direct current generators in sizes from 15 to 50 kw. and for alternating current from 30 to 50 kw.

Write for Leaflet 2021.

Type Q Engine Driven Direct Current Commutating Pole Generators—Cool operation, high overload capacity, sparkless commutation under all loads and fixed brush position characterize this type. Each armature is arranged for mounting on a prime mover shaft, which is furnished together with the bearings by the builder of the engine.

For capacities up to 250 kw., the standard voltages are 125 and 250; from 100 to 400 kw., 275 and 600 volts; from 250 to 1000 kw., 250 volts.

Any type Q machine can, at increased price, be arranged for 3-wire service.

Ventilation exceptionally effective.

For all particulars, send for Leaflet 2371-A.

Direct-Connected Turbine Generator Units—Built in capacities of 5, 7½, 10 and 15 kw. Especially developed to meet the demand for a small direct current, non-condensing turbine generator set for lighting and power work.

Designed to serve as 125-volt exciters for alternating current generators for lighting small industrial plants, coal mines, construction operations and for furnishing current (250 volts) for locomotive crane magnets.

See Leaflet L-2000-A.

Locomotive Headlight Turbine Generator Units—Capacity, 500 watts at 33 volts, direct current. Especially developed to meet the requirements and recommendations of steam railroad motive power engineers.

Can also be used for lighting service in small isolated steam plants, pumping stations, shovel excavation work, oil derricks, etc. Unit is small, light, compact, requires no foundations and is very desirable in portable applications. Totally enclosed, weatherproof and dustproof and can be used indoors or outdoors.

See Leaflet 3485A.

Alternating Current Generators

Type G Belt Driven Alternating Current Generators—Capacities, 25 to 312 kv-a. Small industrial plants requiring belt driven alternators find the type G line of 60-cycle generators well suited for this service. Generators up to 125 kv-a. have bracket type supports for shaft and bearings. Larger generators have pedestal type bearings. Furnished for belted exciter or direct-connected exciter.

Highly efficient at all loads; well ventilated; simple in electrical and mechanical construction; made of high grade material; economical to operate and maintain; carefully inspected and tested before shipment.

For further information, see Leaflet 2389.

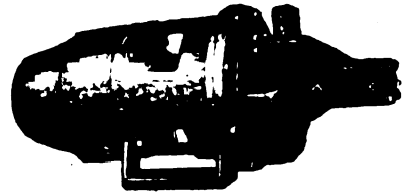
Type E Engine Driven Alternating Current Generators—Capacities, 62½ to 1750 kv-a. The practical experience of the WESTINGHOUSE ELECTRIC & MFG. CO. in the design and construction of various types of alternators has been embodied in type E generators, which constitute a standard line of 60-cycle alternators and which are applicable to all prime movers. Suitable for direct connection to steam, gas or oil engines and slow speed horizontal water wheels.

They are efficient at all loads; rugged and long lasting; economical to operate and maintain; carefully inspected and tested before shipment.

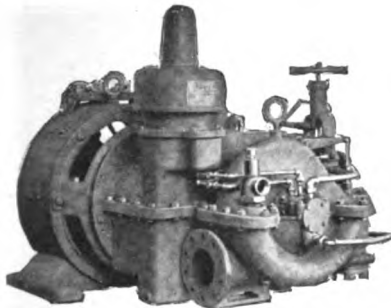
See Leaflet 2390.

Type EA—A modification of the type E generators, all iron covers and guards not absolutely necessary being removed. The cost of this type is therefore materially less than that of type E.

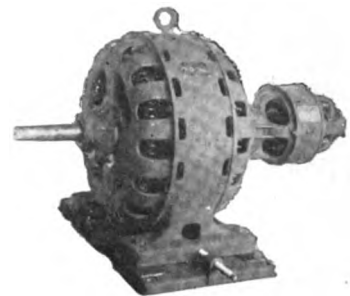
See Leaflet 2040.



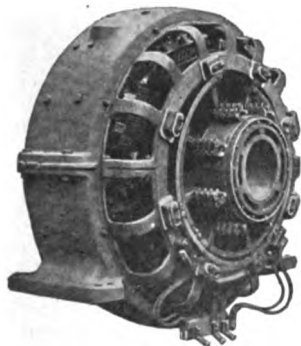
LOCOMOTIVE HEADLIGHTER UNIT



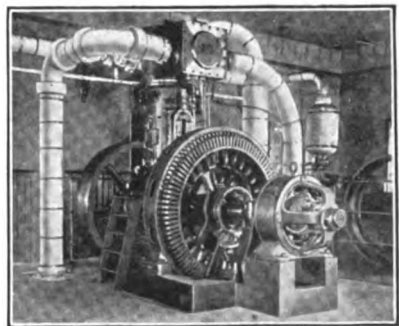
WESTINGHOUSE GEARED TURBINE GENERATOR UNIT



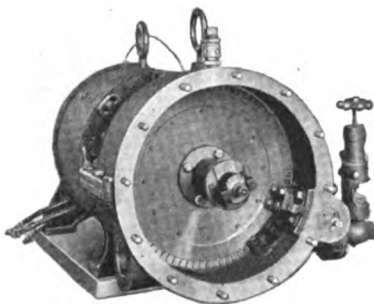
TYPE G 75 KV-A. BRACKET TYPE GENERATOR WITH DIRECT-CONNECTED EXCITER



REAR VIEW OF TYPE Q ENGINE DRIVEN DIRECT CURRENT COMMUTATING POLE GENERATOR



250 KV-A. STEAM ENGINE DRIVEN UNIT WITH DIRECT-CONNECTED EXCITER

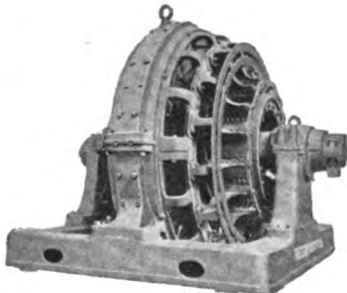


WESTINGHOUSE DIRECT-CONNECTED TURBINE GENERATOR UNIT

Commutating Pole Synchronous Converters

The great number of Westinghouse synchronous converters ranging from 100 to 4000 kw. in successful operation on widely varying conditions demonstrate that these machines are unequalled for simplicity, strength, ruggedness, compactness and exceptionally large capacity.

As compared to converters of ordinary design, they



2000-Kw., 600-VOLT, 60-CYCLE COMMUTATING POLE
SYNCHRONOUS CONVERTER

possess better inherent commutating characteristics, commutating poles, composition leaf brushes, well distributed welded-damper windings and increased ventilation of windings.

Adapted to railway and industrial service not requiring direct current voltage adjustment in all capacities and voltages. Arranged for alternating current or direct current, self-starting or both.

See Leaflet 3823-C.

Transformers

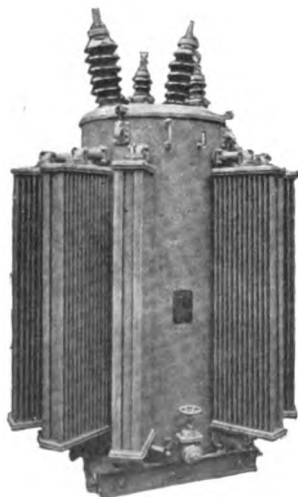
Many years of development and steadily effected improvements have brought Westinghouse transformers to a high degree of perfection. Improvements have been made in the materials used, in their design and construction, and incorporated with all modern developments of good electrical engineering application.

Westinghouse transformers are made in 2 general types, one for station or substation use, the other for distribution work.

Type OISC Transformers—In many substations and some generating stations, where auxiliary equipment and required attendance must be reduced to a minimum, or where an abundant supply of cooling water of proper character is not available, transformers of the self-cooling type must be installed. Westinghouse OISC oil-immersed self-cooling transformers of the radiator type are designed to meet these requirements. The fact that no piping, pumps or blowers are required makes the self-cooling type particularly applicable for general service of all kinds.

OISC transformers are made for all capacities and voltages. They are wound for single- and 3-phase service and can be supplied for any frequency.

For full particulars, see Leaflet 3560-A.



LARGE SIZE OISC TRANS-
FORMER, RADIATOR TYPE

Type OIWC Transformers—There is an increasing demand for transformers of greater capacity and for higher voltages. Beyond a certain size, it is too costly to build the self-cooling type.

Westinghouse oil-immersed water-cooled OIWC, transformers embody fundamentally correct principles of design, and the factors of construction are carefully balanced, thus guaranteeing long life, efficient performance and security against breakdown.

They are immersed in oil, contained in heavy boiler iron tanks of welded seams; are moistureproof and dust-proof; have automatic thermometer alarm; have reliable cooling system; shell or core form wound; built for any capacity above 200 kv-a.; shipped complete in tanks with oil.

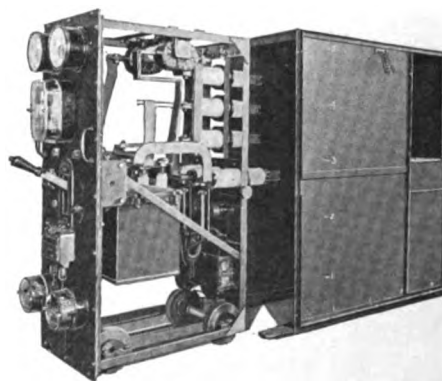
See Leaflet 3566.

Steel Clad Type S Distribution Transformers

Range in capacity from 1 to 200 kv-a., and are listed for voltage from 460 to 34,500 in both 25 and 60 cycles. As no one form of construction is best adapted for this wide range of capacity and voltage, Westinghouse distribution transformers are made in 4 different types of construction: (1) Distributed shell, single-phase. (2) Rectangular core, single- and 3-phase. (3) Crucible core, single-phase for 34,500 volts. (4) Simple shell, large capacity. These distribution transformers are furnished for pole, platform or manhole mounting.

The reduction in weight which has resulted from

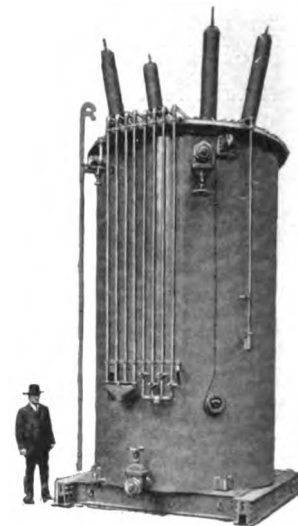
the substitution of sheet metal for cast iron is the outstanding feature of Westinghouse distribution transformers, and an improvement on the older well-known type S transformers which have proved so successful.



TRUCK-TYPE SWITCHBOARD

Outdoor Substations

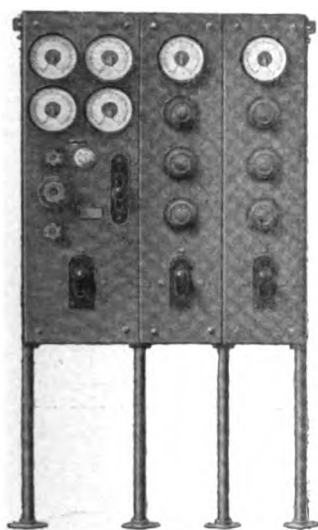
Westinghouse is prepared to furnish many different types of substations and steel towers. These substations can be used for any voltage up to 36,000. They are equipped with 3-pole type B horn gap switch, single-pole type R combined horn gap, lightning arresters, choke coils and fuses.



ONE OF SIX 150,000-VOLT
TRANSFORMERS BUILT FOR
THE SOUTHERN SIERRAS
POWER CO.



GROUP OF STEEL CLAD
TYPE S TRANSFORMERS



TYPE JB ALTERNATING CURRENT SWITCHBOARD PANEL

trial plants and central stations.

Switchboards

Westinghouse manufactures a full line of switchboards for all systems of electrical distribution.

Westinghouse switchboards, by the use of 7-in. instruments and remote control oil breakers, require a minimum amount of floor space. The front of the board is entirely symmetrical and all indicating instruments match perfectly in appearance. A complete line of standard panels is listed for prompt shipment.

Type JB switchboard shown is particularly adapted to the control of single or parallel operated alternators in small industrial plants and central stations.

Switchboard Instruments

Westinghouse offers a full line of indicating, recording and integrating instruments. This line includes voltmeters, ammeters, wattmeters, etc.; frequency meters, synchrosopes, etc. Westinghouse instruments comprise the only complete line of 7-in. alternating current instruments with 14 1/4-in. scales on the market and have full, open glass fronts. Corresponding direct current instruments have scales that are equal to any 9-in. instruments previously used. Three of these 7-in. instruments can be mounted horizontally on a 24-in. panel and two on a 16-in. panel.

Among the many applications of the type M portable graphic wattmeter are the analysis of motor operation, charting of the typical consumption curves of large industrial plants and obtaining records of power distribution.

The polyphase wattmeter, when properly connected, indicates the true power in a 2-phase, 3- or 4-wire or a 3-phase, 3-wire circuit regardless of the power factor or the degree of unbalance between phases.

Circuit-breakers

Westinghouse offers many types of carbon and oil circuit-breakers which give satisfactory service in all kinds of railway, industrial and building service. They successfully meet such conditions as overload or short circuit, underload, undervoltage, overvoltage, reverse current or unbalanced voltage in 3-wire systems.

Type CA Carbon Circuit-breakers—Particularly

designed for the severe current carrying and interrupting conditions found in operating low voltage direct and alternating current systems.

When conditions make it desirable to operate circuit-breakers from a distance, the electrically operated form, or the manually operated remote control within its limited application, is furnished.

Type CD Carbon Circuit-breakers—May be used for motor starting control of industrial circuits and for control of feeder circuits. They are supplied for voltages up to 750 and for capacities up to 300 amperes.

Type F Oil Circuit-breakers—Manually and electrically operated, non-automatic and automatic, single or double throw for indoor or outdoor service. Built for capacities up to 3000 amperes at 13,200 volts A.C.; interrupting capacities at rated voltage, 1000 to 15,000 amperes.

Type F oil circuit-breakers comprise a complete line of moderate capacity, non-automatic and automatic, manually and electrically operated breakers. For indoor service, the breakers are made in the panel mounting and remote control wall or pipe mounting forms and for outdoor service in pole or subway mounting forms.

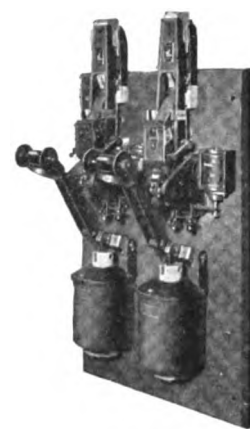
Large Oil Circuit-breakers—In addition to the moderate capacity circuit-breakers described above, Westinghouse offers a complete line of large capacity and higher voltage oil circuit-breakers.

They are manually or electrically operated, automatic or non-automatic, and are arranged for panel, wall, pipe or cell mounting. In the latter case, the breaker may be mounted in fireproof compartments of brick, asbestos or concrete structures and placed in individual or common cells, depending on the capacities and voltages to be handled and the degree of isolation required.

Designed for capacities up to 400 amperes, 60 cycles and alternating current voltages up to 25,000.

Generator Voltage Regulators

The problem of voltage regulation on constant potential circuits is of great importance. The operating company is no longer a purely lighting company, but largely a power supply center as well, and



TYPE CA ELECTRICALLY OPERATED CARBON CIRCUIT-BREAKER



TYPE F INDOOR MANUALLY OPERATED OIL CIRCUIT-BREAKER



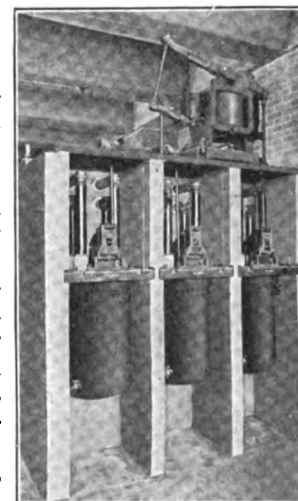
TYPE SM 7-IN. ALTERNATING CURRENT AMMETER



POLYPHASE WATTOUR METER



TYPE M PORTABLE GRAPHIC WATTMETER



TYPE O-2 OIL CIRCUIT-BREAKER

hence the regulation of generator voltage has become more difficult.

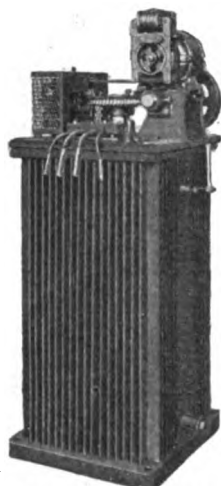
Alternating current regulators are used to maintain constant voltage at regulator or bus at the end of transmission lines for controlling boosters, converters and condensers and for the maintenance of constant current instead of constant voltage.

Direct current regulators are used for the maintenance of constant voltage on direct current generators where current is used for power only and to the maintenance of constant current.

Westinghouse manufactures a full line of direct current and alternating current regulators for these purposes. They are usually mounted on panels for switch-board work.



TYPE AB-4 GENERATOR VOLTAGE REGULATORS



INDUCTION FEEDER REGULATOR

Feeder Voltage Regulators

These regulators permit maintenance of uniform voltage at center of distribution of each feeder of an alternating current transmission system by independently compensating the voltage drop. In the induction type, practically an infinite number of steps of regulation are offered. Maintenance expense is low.

Made for all classes of service and for circuits of any commercial size, voltage or frequency. For automatic motor operation, the regulator is operated by a motor and electric brake controlled through a set of relays and a line drop compensator.

Krantz Safety Enclosed Auto-lock Switches

Desirable in steel mills, factories, mines and similar places employing men having practically no knowledge of electricity and its attendant risks and where switches in exposed locations are subject to damage from loaded trucks or the handling of heavy material.

Construction—Equipped with double-break brush-type movable blades which can not weld shut from slow closing by careless operators (a decided improvement over ordinary knife switch construction), because brushes have arcing tips that protect the brush leaves. Contacts easily replaced. Switch is enclosed in a sheet metal box made of No. 12 gage steel. Stationary contact are of hard drawn copper and, with fuse clips and terminals, are mounted on slate bases. Moving contacts are laminated spring-copper brushes double-ended with auxiliary arcing at each end. All fuse connections are provided for the use of N.E.C. enclosed fuses up to 600 amperes, inclusive. Covers easily removable for inspection; brushes insulated from cross bar; housing waterproof and acidproof.

Operation—Switches with other than standard size or arrangement of conduit holes will be supplied on special order without extra charge.

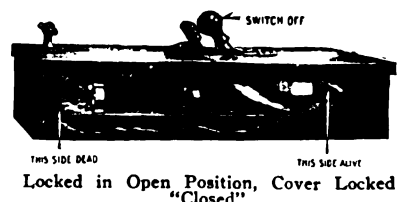
The door over the fuses is automatically locked

when switch is in "closed" position. When switch is in "open" position, door can be opened. With door open, switch can not be closed. When switch is in "open" position, brushes completely obstruct the passage between fuse chamber and live contact chamber, making it impossible to reach the hand in far enough to touch the live stationary contacts. Switches are all made with fuse holders at the bottom, which is the outgoing end, so that the fuse holders are always "dead" when switch door is opened, thus fuses can be replaced in perfect safety. Box can be padlocked in the "on" and "off" positions.

Types and Voltages—Made in 2-, 3- and 4-pole types; 250 volts A.C. or D.C., 30 to 1000 amperes, fused; 500-600 volts A.C., 30 to 600 amperes, fused; 250 volts D.C. and 600 volts A.C., 30 to 1000 amperes, unfused.

Lightning Arresters

Westinghouse electrolytic arresters have been developed for maximum results and have the greatest freedom of discharge and protective effect possible in the present state of the art. The Westinghouse impulse gap, when used with electrolytic arresters in place of



Locked in Open Position, Cover Locked "Closed"

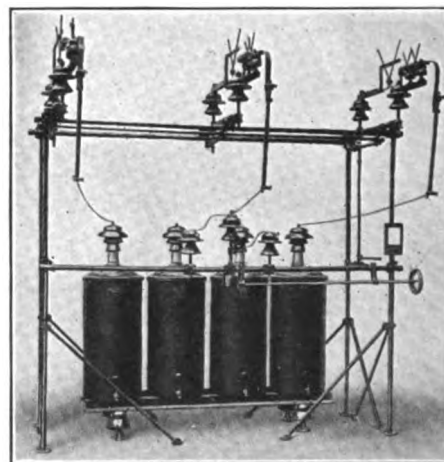


THIS SIDE MUST BE CONNECTED TO LOAD THIS SIDE MUST BE CONNECTED TO LINE Contacts Closed. Cover Can Not Be Opened



Showing Impossibility of Touching Live Parts

KRANTZ AUTO-LOCK SWITCH



ELECTROLYTIC LIGHTNING ARRESTER

the plain sphere gap, selects high frequency or steep wave front static impulses and discharges them at a much higher voltage than the normal frequency discharge voltage of the gap, thus adding greatly to the protective value of this form of arrester. A complete line of arresters and choke coils for all classes of service is provided.

Westinghouse Motors

Westinghouse motors can be supplied for every service and for operation on every commercial circuit. No attempt is made to give a complete list of industries in which motors have been economically used, but the following table indicates those industries on which very complete information is available and which will be sent on request at our nearest office.

MOTOR APPLICATIONS

Cement plants	Metal mines
Chemical plants	Metal working
Coal mines	Paper mills
Contractors	Printing plants
Electric shovels	Pumping plants
Electrochemical	Refrigerating
Flour mills	Rubber
Hoists	Smelters
Industrial locomotives	Steam railroads
Laundries	Steel mills
Leather	Woodworking

Type HK Direct Current Motors for Cranes, Hoists and Similar Service—Designed for severe, intermittent, varying speed service where high starting torque is required and where load consists of series of starts, stops, reversals and short periods of idleness. Capacities, 2 to 25 h.p., 230 volts. Ask for Leaflet 1123.

Type SK Direct Current Motors for General Application; Constant and Adjustable Speed—Type SK motors are for general service in all industrial applica-



TYPE SK MOTOR ARRANGED FOR BELTED SERVICE



TYPE SK VERTICAL MOTOR

tions using direct current and are supplied for either constant or adjustable speed service. They are especially adapted for driving machine tools. They are supplied open, semienclosed, splashproof or totally enclosed, according to the conditions under which they must operate. Capacities, 1½ to 250 h.p.; 115, 230 and 550 volts. Horizontal motors may be furnished for belted, geared or coupled service.

This type can also be supplied for vertical drive, such as for operating sump pumps, etc.

See Leaflet 2359.

Type CI Wound Rotor Motors for Hoists and Similar Intermittent Service—These are of the alternating current wound rotor type for polyphase circuits for varying speed service where starting conditions are severe.

Capacities from ½ to 300 h. p. See Leaflet 1242.

Type CW Motors (Wound Rotor Alternating Current)—Type CW motors range in capacities from ½ to 650 h.p. and are suitable for all commercial cir-

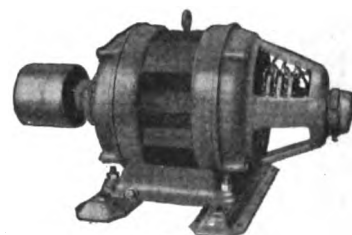
cuits. They are built for varying speed, have high starting torque, are designed for continuous duty and are arranged for belted, geared or coupled service.

The starting current is low.

Mill Motors (Types MC and MA)—For steel mills and other severe services where varying speed is required, the type MC motor for direct current and the type MA for alternating current are applicable. They have steel frames, massive shafts, very large bearings, fire-proof insulation and other features that insure reliability. Commutating - poles in type MC motors insure sparkless commutation.

Capacities, type MC motors, 5 to 250 h.p.; type MA motors, 5 to 162 h.p. for 25 cycles. They are completely and fully housed, rendering them dustproof.

Type CS Motors (Squirrel Cage Alternating Current) for General Industrial Service—Applicable wherever industrial machinery requires constant speed drive. These motors are made in all standard sizes of 2 h.p. and larger for all commercial voltages and frequencies.



TYPE CW MOTOR



MILL MOTOR



TYPE CS BUILT-UP HORIZONTAL TYPE MOTOR

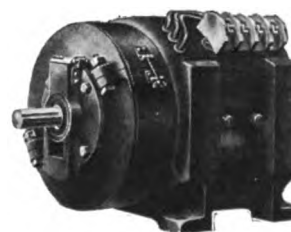


TYPE CS VERTICAL MOTOR

The horizontal motors are furnished for belted, geared and coupled service and in some cases are back geared for special services. They are wound with a specially prepared impregnated winding, thus insuring them from deterioration when exposed to ordinary conditions of moisture as encountered in mines and pump pits.

A specially constructed rotor with brazed windings which insure continuity of service. All mechanical parts such as shaft and bearings are very rugged.

For further details, see Leaflet 1160A.



TYPE K CRANE MOTOR

Type K Crane and Hoist Motors—Type K motors, direct current, 2 to 52 h.p., are suitable for severe intermittent service where high starting torque is required. They are totally enclosed.

Type CA Motors for Advertising Devices, Small Blowers, etc.—Westinghouse type CA motors are split-phase induction motors which can be operated from a single-phase lighting circuit, or from any phase of a polyphase power circuit to drive many small machines, such as advertising devices, office devices, small blowers, etc.

They are capable of innumerable starts and give years of service with very little attention except occasional oiling. They are interchangeable with type CD motors of the same rating.

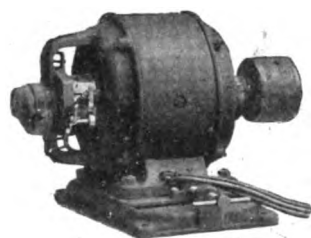
Type CAH Alternating Current Splashproof Motors for Washing Machines, Pumps, etc.—Single-phase, splashproof, clutchless and with clutch. Capacities $\frac{1}{8}$ to $\frac{1}{4}$ h.p. Many small motors applications such



TYPE CAH MOTOR

as washing machines, water pumps, etc., require compact splashproof motors with high starting and breaking down torques. Type CAH motors possess not only these desirable characteristics but many others and can be operated from single-phase commercial lighting circuits. Have ample ventilation through the peculiar ducts in the end brackets, thus making them suitable for a wide range of application. They are interchangeable with type CDH motors of the same rating.

Type CD Motors for General Applications—Shunt wound, $\frac{1}{20}$ to 3 h.p.; compound wound, $\frac{1}{2}$ to 3 h.p. The smaller sizes are suitable for advertising



TYPE CD MOTOR WITH SLIDING BASE

devices, office devices, etc., and the larger sizes for general applications, such as drill presses, vacuum pumps, etc. They are well designed for strength and compactness, and will operate successfully with hard usage and unskilled handling, to which they are often subjected. These motors are interchangeable with type

CA motors of the same rating.

Type CDH Direct Current Splashproof Motors for Washing Machines, Pumps, etc.—Continuous service capacity, $\frac{1}{8}$ to $\frac{1}{4}$ h.p. This type is also designed for use with pumps and other equipment requiring motors practically enclosed. Carefully designed ventilating ducts maintain unusually low temperatures.

Designed for durability. Can be arranged for either wall or ceiling mounting by changing detachable end brackets. Furnished for floor mounting unless otherwise specified. Sliding base furnished if desired. They are interchangeable with type CAH motors of the same rating.

Type AR Motors for Compressors, etc. (Automatic Starting)—Alternating current, single-phase, constant speed, $\frac{1}{2}$ to 10 h.p., repulsion and induction types. Fulfill the demand for simple, reliable, single-phase motors having high starting torque with low starting current for such applications as pumps, rotary blowers, compressors, etc. They are self-starting and require only a double-pole switch or circuit-breaker. A starting rheostat can be supplied, however, where especially low starting is desired.

Synchronous Motors—Westinghouse synchron-

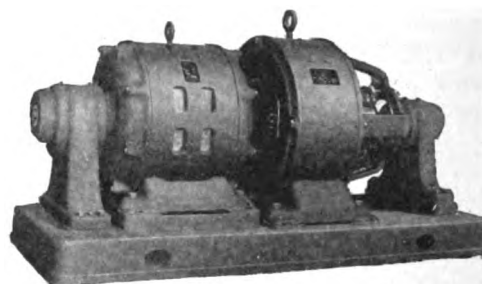
ous motors are furnished either belted, coupled or engine type for compressor drive. Their application gives a means of improving the power factor of industrial loads, resulting in better voltage regulation, improved line conditions and higher operating efficiency of the distributing system.

Motor-generators for Industrial Service—

Where the only available circuits are alternating current, a most satisfactory method of obtaining direct current for such applications is by using a Westinghouse motor-generator. A complete line of motor-generators has been designed, providing machines for every class of service.



TYPE G SYNCHRONOUS MOTOR WITH PEDESTAL BEARINGS



WESTINGHOUSE MOTOR-GENERATOR SET

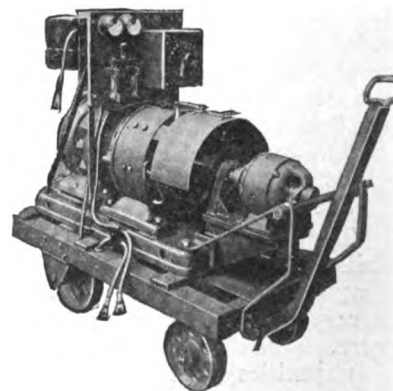
Standard Westinghouse motor-generators will supply direct current of 125 to 250 volts for elevator service, machinshops, crane and mill work, and mines. The latter sets are of type SK generators driven by type CS or synchronous motors.

For charging vehicle storage batteries, type SK generators will be shunt wound with voltage adjustment from 125 to 60 volts.

For application in motion picture theaters, Westinghouse motor-generators are furnished with 75-volt flat compound-wound generators in sizes of $2\frac{3}{4}$ to $8\frac{1}{4}$ kw. The motors for running these sets are available for all commercial circuits.

Arc Welding Equipment

Westinghouse arc welding equipment can be used to advantage in practically every industrial plant. Those plants that fabricate iron, steel or even alloy products can profitably make use of arc welding to the improvement of present manufacturing processes and every plant can utilize arc welding for repair and reclamation work. Westinghouse equipment can be supplied in either stationary or portable form, the selection being determined by the class of work to be done.



COMPLETE A. C.—D. C. PORTABLE ARC WELDING OUTFIT

The operation of the process is simple and can easily be learned by an intelligent mechanic.

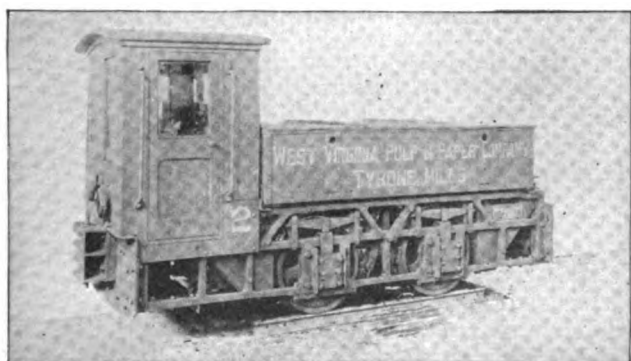
The portable outfit shown on preceding page consists of a motor-generator and a control panel mounted on a truck.

The motor-generator is equipped with ball bearings so that accurate leveling of the truck at each new location is not necessary. The generator of the set has a capacity of 175 amperes and the design of the control is such that a current adjustment of less than 9 amperes per step can be obtained. Either an alternating or direct current motor can be supplied, depending on the power supply available.

This is a most efficient equipment, as the generator operates at arc voltage and no resistance is used in circuit with the arc. The generator is designed to inherently stabilize the arc and this eliminates auxiliary relays and similar devices, with their possibilities for trouble.

Haulage Locomotives

Baldwin-Westinghouse locomotives can be used with economy and efficiency for general haulage around industrial plants. These locomotives are of the mine type and their ruggedness of construction guarantees continuous and uninterrupted service. The two most important features that contribute to their uniform dependability are the use of barsteel frame and commutating-pole motors with ball bearings.



TYPE A-8-2 6-TON STORAGE BATTERY LOCOMOTIVE

When conditions are such that neither a trolley wire nor third rail can be used with safety, the storage battery locomotive is particularly desirable.

For general work in yards, the addition of a cab or canopy will afford protection to the operator from inclement weather.

Westinghouse Controllers

It is impossible to describe all types and modifications of Westinghouse motor starters and controllers. It will suffice to say that Westinghouse manufactures a full line of this equipment in the field of electrical engineering at the present time. A few of the more important types are outlined briefly as follows:



TYPE D MOTOR STARTING RHEOSTAT

Type D Motor Starting Rheostats—Type D starting rheostats are used for starting shunt, compound and series wound direct current motors. These starters are characterized

by strong, compact, fireproof construction and have the approval of the National Board of Fire Underwriters. They are self-contained, consisting of a face plate with renewable segments, low-voltage release mechanism and self-contained resistance.

Type DM Motor Starting Rheostats—For use in mines and other places where the apparatus is exposed to moisture and acid fumes. They are practically the same in construction as type D except that they are made impervious to moisture and fumes.

Type S Drum-Contactor Controllers—Maximum ratings, 37, 75 and 125 h.p. at 115, 230 and 550 volts. For shunt, series and compound-wound direct current motors, by adjusting resistance in series and parallel with the motor armature. They are applicable to cranes, hoists, crushers, bridges, roll and transfer tables, punches and practically all applications employing this system of control. These controllers are noted for their low maintenance, long life of contacts and general accessibility.

Ask for Leaflet 1742.

Machine Tool Drum Controllers—The type V-5, 245, 246 and V-4 controllers range from 1 to 50 h.p. at 110 to 550 volts and are used with shunt and compound-wound direct current motors in machine tool operation where reversing and speed adjustment by field control is required.

These controllers have been designed with special reference to ease and accuracy of operation. They may be started, stopped, reversed and brought to desired running speed by means of a single handle.

Ask for Leaflet 1443.

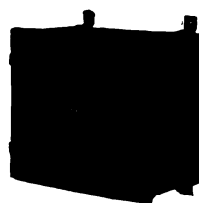
Type C Automatic Direct Current Starters and Controllers—For constant and adjustable speed motors, reversing and non-reversing service.



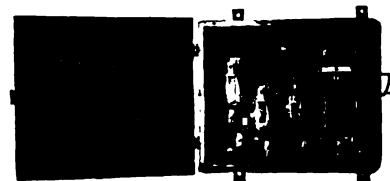
TYPE S CONTROLLER WITH VERTICAL HANDLE



TYPE V CONTROLLER WITH COVER REMOVED



Door Closed and Locked



Door Open

TYPE C AUTOMATIC STARTERS AND CONTROLLERS

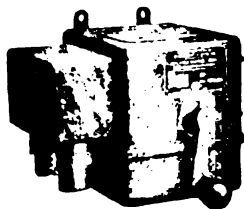
The Westinghouse automatic starter is operated by simply pressing a button or pulling a master switch, the motor thereafter accelerating with scientific exactness, preventing excessive starting current. The personal factor is eliminated and in certain applications such as compressors and pumps where predetermined pressures on fluid levels are to be maintained, no attendant is required. Automatic devices, such as float switches and pressure regulators, are used to start or stop these starters and automatically maintain the proper liquid level or pressure.

These starters are small and compact and in practically all cases (50 h.p. and below) may be mounted

directly on machine, wall or other convenient place. They may be furnished with or without enclosing cover.

There are many forms and modifications of this type giving a remarkably flexible control service of every kind of electrical equipment. They are roughly divided into 4 classes: (1) For constant speed motors, non-reversing. (2) For constant speed motors, reversing. (3) For adjustable speed motors, reversing. (4) For adjustable speed motors, non-reversing. General capacities, 1½ to 200 h.p.; 115, 230 and 550 volts.

Quick-made and Quick-break Starting Switches, Types 815 and 816—For squirrel cage induction motors, 25 h.p. and below, 2- and 3-phase, 25, 40, 50 and 60 cycles and 110, 220, 440 and 550 volts. They connect the motor directly to the line; provide overload and low voltage protection; may be operated by hand or shipper rod.



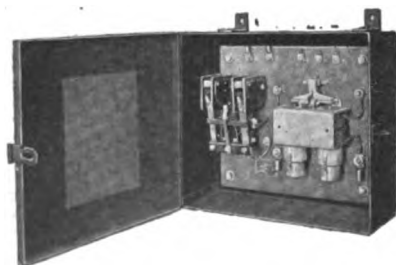
STARTING SWITCH COMPLETE WITH OVERLOAD AND LOW VOLTAGE PROTECTION

Type A Auto-starters—For squirrel cage induction motors; 5 to 200 h.p.; 2- and 3-phase; 25, 40, 50 and 60 cycles; 220, 440, 550 and 2200 volts.



TYPE A AUTO-STARTER

Type F Automatic Starter for Alternating Current Squirrel Cage Motors—Westinghouse type F line voltage automatic starters connect motor directly to line, and combine the advantages of push button, remote control with safety and convenience to operator and full protection to motor itself. The outstanding features are: Remote control, automatic operation, complete enclosure, low voltage release, overload protection, single-phase protection, compactness and knockouts for conduit windings.



TYPE F AUTOMATIC STARTER

400 h.p. are described in Leaflet 1660.

Have the following advantages: Protect operator from shocks and burns; protect both man and equipment against unexpected or accidental starting of motor; protect motor against burnouts without the use of fuses; can not be held closed on overload; foolproof; reduce shutdowns; long life under severe operating conditions; easy to install.

Type A auto-starters consist of an auto-transformer unit together with the switching mechanism, low voltage and overload relays all mounted in a dustproof case, arranged for open or conduit wiring. A compact, self-contained unit easy to handle and install. Especially desirable for mounting on driven machine or other places where space is limited.

Maximum horsepower, 25; 2- and 3-phase; 110, 220, 440 and 550 volts; 25 to 60 cycles. See Leaflet 1667.

Type F automatic starters employing resistance or auto-transformers for motors of 5 to

Drum Controllers for Alternating Current Wound Rotor Motors, Reversing or Non-reversing—Types FA and RF are used for starting, stopping, varying the speed and reversing alternating current wound rotor induction motors, 200 h.p. and below. Simple in construction and reliable in operation.

Type F automatic starters for wound rotor motors, reversing and non-reversing, for 600 h.p. and below are described in Leaflet 1661.

Magnet Operated Brakes for Alternating and Direct Current Motors, Types A and B—Used for stopping direct current motors quickly without jar or shock and for holding their connected loads. Designed for use where frequent stops and reversals are made. Brake is simple and rugged and consists essentially of a frame supporting a clapper type magnet, strong compression springs, levers, brake shoes and wheel.

The clapper type magnet has several advantages over the solenoid type. There are no moving parts within the coil; when power is off, powerful compression springs force the brake shoes against the brake wheel; when power is on, the clapper type magnet compresses the springs and releases the brake wheel.

Smooth retardation; equal retarding torque in both directions; no slipping of load; applicable to any horizontal motor in range; furnished with either series or shunt operating coils.

Ask for descriptive Leaflet 1751-B.

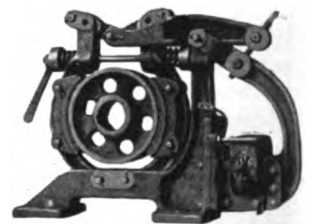
Muffle Furnaces

Multiple replaceable unit muffle furnaces may be effectively used to increase the efficiency of any heat treating operation where any other make of electric furnace or any gas, oil or fuel fired furnace has been used heretofore. They are used for laboratory operations such as drying of precipitates, ash determinations, fusions, ignitions, heating metals and alloys, for enameling, jewelry, watch and clock dials, etc., for annealing metals, for hardening high carbon steels such as safety razor blades, dies, punches, milling and form cutters, and for experimental test work and laboratory uses.

The efficiency of the multiple unit furnace is extremely high, as shown by these features: A type 50 muffle furnace, starting from cold and developing 1600° Fahr. (870° Cent.) in 45 minutes showed an actual surface temperature on the furnace shell of only 110° Fahr. (43° Cent.). In continuous operation, there is but a slight increase of surface temperature; the heat loss through radiation has been reduced to a minimum. This is characteristic of all types.



TYPE RF DRUM CONTROLLER



TYPE A MAGNET OPERATED BRAKE



TYPES 50, 52, 54 AND 56 MUFFLE FURNACE

Industrial Lighting Reflectors and Fixtures

Good illumination on an average saves 30 minutes of each man's time per day, representing an amount more than ten times sufficient to pay for the installation. It gives increased production for the same labor costs and overhead, reduces the amount of spoilage and seconds, decreases eyestrain and creates better sanitary and more cheerful conditions for employees.

The engineering department will assist in making plans and estimates. When submitting sketches, give class of work to be performed, dimensions of rooms, height of ceiling, location of work benches, color of walls and whether conduit or open wiring is to be used.

Type RLM Standard Dome Type Reflector—

The latest and most efficient design available for general illumination in factories. Where high mounting is possible, bowl type reflectors are used; for low ceilings, the RLM type. Glare may be reduced by the use of opal glass bowls with RLM standard dome reflectors. For localized lighting, the bowl type is most satisfactory.

Holder-Socket-Reflectors—Easy to wire. Guaranteed weatherproof. Holder-socket-reflectors are combinations of "Cutter easy-to-wire" holder-sockets and the standard types of high efficiency one-piece enameled steel reflectors—dome, bowl and angle.

Holder-socket saves 75% of time ordinarily required to install lighting fixtures of these types and is interchangeable. Reflectors of different types may be substituted at any time.

Holder-socket-reflectors may be used in any type of installation and for either interior or exterior purposes. They may be suspended on a $\frac{1}{2}$ - or $\frac{3}{4}$ -in. conduit, directly from outlet box, on chain or cord by means of suspension eyes, and on reinforced drop cord by using porcelain bushings.

Pulley-Socket-Reflectors—

Facilitate cleaning reflectors without use of ladders, thus saving much time and expense with absolute protection against accidental electrical contact. This fixture may be used with angle type reflectors and other reflectors requiring a fixed location. The position of the lower switch is always the same with respect to the upper part of the pulley.

Standard Heel Reflectors—Different types of reflectors with same size heel may be used with same socket, permitting change in light distribution without disturbing the wiring. Reflectors easily removed for cleaning. The $2\frac{1}{2}$ -in. heel supplied on reflectors for 200-watt lamps and smaller; $3\frac{1}{4}$ -in. heel on reflectors for 300-watt lamps and larger.

"Cutter" Holder-Sockets—For $2\frac{1}{4}$ - or $3\frac{1}{4}$ -in. standard heel reflectors. Approved by National Board of Fire Underwriters. They permit of the greatest flexibility in light distribution.

Holder-sockets are made with cap for attachment on conduit stems, to boxes, and with drop cord.



HOLDER-SOCKET-REFLECTOR
Angle type

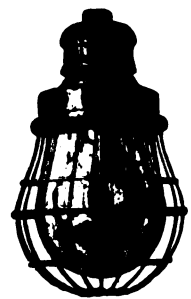


PULLEY-SOCKET-REFLECTOR
RLM dome type

Vaporproof Fixtures—"Safety first" units of highest class designed for plants where explosive gases and dust accumulating in the standard types of industrial lighting fixtures would cause explosions and fires, or where moisture and smoke fumes would hasten corrosion of exposed metal parts.

Each fixture uses a Cutter holder-socket. Special gaskets are used in all joints to make the fixtures tight.

Luxsolite Fixtures—Types CI and SP cast iron Luxsolite fixtures



VAPORPROOF FIXTURES WITH PEAR SHAPE GLOBE AND GUARD



TYPE SP LUXSOLITE
FIXTURE WITH RE-
FLECTOR AND LUX-
SOLITE GLOBE



TYPE CI LUXSOLITE
FIXTURE WITH RE-
FLECTOR AND SOL-
LUX DIFFUSER

are used with Westinghouse Mazda C lamps for lighting of residential streets, parks, industrial plants, etc.

Their rugged construction makes them especially useful for hard service.

Luxsolite fixtures are made in two types, namely, CI and SP.

Type CI is furnished with a special auto-transformer to increase the efficiency of the ordinary commercial circuit or is provided with film cut-outs or multiple sockets. Divided into two chambers, the upper (containing the transformer) being ventilated, while the lower containing socket and lamp is sealed against insects and dust.

Type SP is of the same construction as type CI except that it is built in one-piece body and transformer is omitted. Also dustproof and bugproof.

Ornamental Posts—Made of a special grade of cast iron which has great mechanical strength and weather resisting properties. The slender graceful columns blend with the surrounding architecture and are not conspicuous in the daytime.

The post tops are designed to distribute the light efficiently without glare.

There are many styles of Westinghouse-Cutter posts and tops from which may be chosen a design particularly suited to surroundings.



COMMERCIAL
POST WITH
SOL-LUX
SENIOR
TOP

FAIRBANKS, MORSE & CO.

Manufacturers
CHICAGO, ILL.

Products

ELECTRIC MOTORS, Alternating and Direct Current; OIL ENGINES.

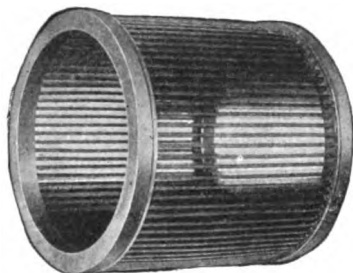
Also manufacturers of Electric Generators, Alternating and Direct Current; Starters; Lighting Plants for Homes or Cities.

For Pumps, see page 630.



Solid Metal Rotor Cage Winding

Used on all Fairbanks-Morse squirrel cage motors over 3 h.p. One piece of solid metal without joints, eliminating repairs occasioned by loose screws and rivets or resoldering joints. This is the original, jointless rotor winding, and insures maximum conductivity.



SOLID METAL ROTOR CAGE

40-degree Rating

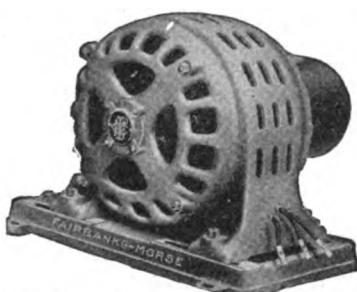
All Fairbanks-Morse motors are 40-degree machines. This feature provides a factor of safety when the load is not definitely known. It gives to the user the feeling of safety and confidence that goes with overload capacity, lower temperatures, higher torque and better all around performance than it is possible to get with a higher rated machine.

"H" Squirrel Cage Ball Bearing Induction Motor

For alternating current. Ball bearings mean less friction, higher efficiency, proved reliability.

"H" motors have grease lubrication. bearings are dustproof; no oil slop.

Bulletin 210.



"H" SQUIRREL CAGE BALL BEARING MOTOR

"KPV" Internal Starter Motor

For alternating current. Especially adapted for remote control. Close a switch to start, open to stop. Switch may be located anywhere. Takes little starting current.

May be used where squirrel cage motors would impair the lighting service.

Bulletin 210.

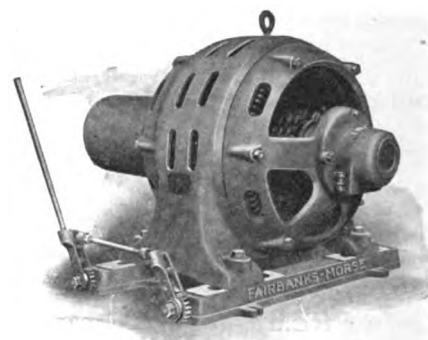


"KPV" INTERNAL STARTER MOTOR

"BV" Slip Ring or Wound Rotor Motor

For use where speed control is desired, or high starting torque with small starting current. For alternating current.

Bulletin 29.

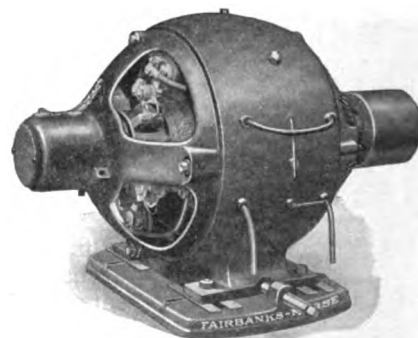


"BV" SLIP RING OR WOUND ROTOR MOTOR

"CPB" Ball Bearing Motor

For direct current. Similar to the "CP" motor except that it has ball bearings. The grease packed ball bearings require little attention.

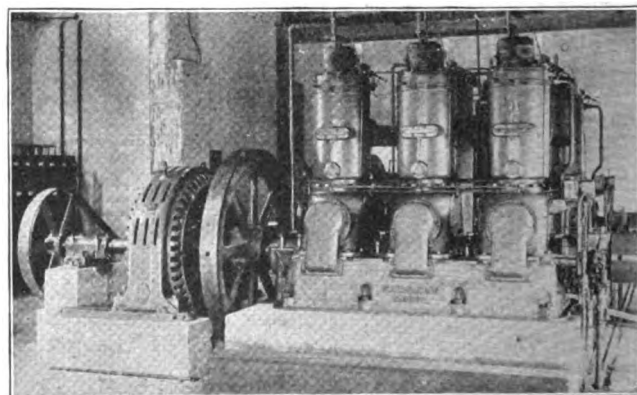
Bulletin 31.



"CPB" BALL BEARING MOTOR

Fairbanks-Morse "Y" Oil Engines and Electric Generators

Fairbanks-Morse "Y" oil engines and electric generators are successfully providing electric lights and power for hundreds of small towns and cities of moderate size. In the industrial field, also, there are many installations of this equipment, such as power plants for factories where the current generated is utilized by motor driven machines and in irrigation projects where "Y" engine electric units supply current to outlying motor driven pumps. We furnish complete plants for direct current from 6 kw. up and for alternating current from 15 kw. up, the entire station equipment being covered by one responsibility. Street lights, commercial lights, residence lights, and power can be furnished from one unit.



MUNICIPAL PLANT INSTALLATION OF "Y" OIL ENGINES AND FAIRBANKS-MORSE ALTERNATIONS

HARVEY ELECTRIC CO.

Engineers and Manufacturers

TELEPHONE
LINCOLN 2000
(Private Exchange)

2000 Southport Avenue
CHICAGO, ILL.

BRANCH OFFICE: DETROIT, MICH.

Products and Services

MOTOR DEPARTMENT: REPAIRING and REWINDING of

Alternating Current Motors and Generators
Direct Current Motors and Generators
Commutators and Compensators
Motor Starters and Controllers
Transformers and Auto Starters
Armatures and Armature Coils
Brushholders and Regulators
Magnet and Controller Coils
Field and Brake Coils
Stators and Rotors

New Alternating and Direct Current Motors, Used Generators and Motors.

This company rewinds all sizes and types of motors

and generators, refills and reinsulates commutators, and repairs all kinds of electric machinery. Old machines rebuilt and remodeled for new use.

All repair work is guaranteed equal in workmanship and service to the original equipment.

DROP FORGE and STAMPING DEPARTMENT: The HARVEY ELECTRIC Co. is equipped to drop forge, stamp or draw copper, brass or bronze for any electrical or mechanical purpose, including

Commutator Segments

Contacts

Controller Fingers

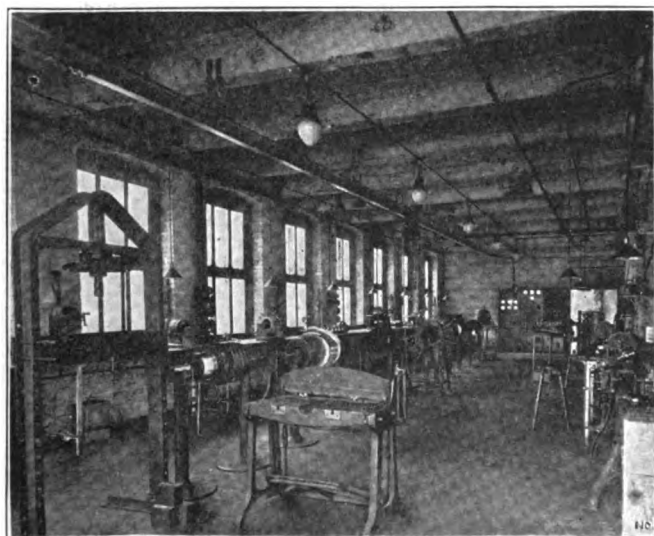
Copper Drawn Work

Punching and Pressing

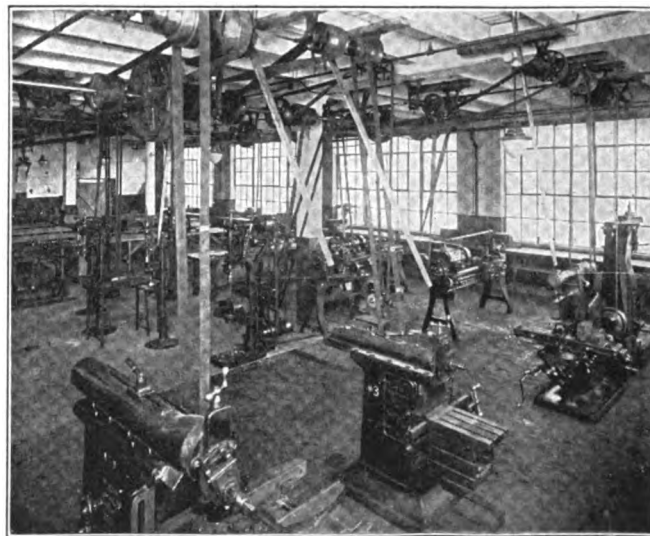
Castings and Cold Drop Forgings for emergencies and breakdowns.



FACTORY AND FORGE SHOP OF THE HARVEY ELECTRIC CO.



MOTOR DEPARTMENT



MACHINE DEPARTMENT

THE MECHANICAL APPLIANCE CO.

Manufacturers of Watson Electric Motors and Generators
MILWAUKEE, WIS.

DISTRICT OFFICES

BUFFALO, N. Y., 311 White Bldg.
CHICAGO, ILL., 28 E. Jackson Blvd.
CINCINNATI, OHIO, 605 Mercantile Library Bldg.
CLEVELAND, OHIO, 5716 Euclid Ave.

DETROIT, MICH., 2631 Woodward Ave.
GRAND RAPIDS, MICH., 317 Powers Bldg.
MINNEAPOLIS, MINN., 1123 Metropolitan Life Bldg.

NEW YORK, N. Y., 409 Broadway
PHILADELPHIA, PA., 1328 Chestnut St.
PITTSBURGH, PA., 1213 Bessemer Bldg.
ST. LOUIS, MO., 1445 Syndicate Trust Bldg.

AGENTS

BOSTON, MASS., THE NEW ENGLAND APPLIANCE Co., 514 Atlantic Ave.
LOS ANGELES, CAL., THE COAST EQUIPMENT Co., 514 Central Bldg.
PORTLAND, ORE., THE COAST EQUIPMENT Co., Lewis Bldg.

PHILADELPHIA, PA., J. M. BRUGLER, 1328 Chestnut St.
SEATTLE, WASH., THE COAST EQUIPMENT Co., L. C. Smith Bldg.
SAN FRANCISCO, CAL., THE COAST EQUIPMENT Co., 766 Folsom St.

Products

WATSON MOTORS, 40° RATINGS for DIRECT and ALTERNATING CURRENT.

Also manufacturers of Generators, Direct and Alternating Current; Motor Generator Sets; Rotary Converters, Frequency Changers; Direct Connected Ventilating and Exhaust Fans; Buffing and Grinding Motors; Special Motors for all drives.

Sales Engineering Service

The many designs of Watson motors make possible selection of equipment to meet the requirements for any service. Special apparatus can be designed and built for any type of drive to meet individual requirements. Our various district offices have complete data on many special motors, and the sales engineers will be pleased to give the benefit of their experience to all who have motor application problems.

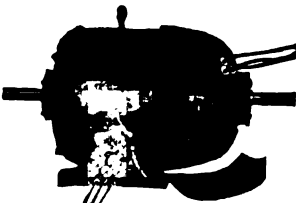
Alternating Current Motors

Ratings—Built for 2- and 3-phase, 60, 50, 40, 30 and 25 cycles and for all standard voltages from 110 to 600 volts. Standard ratings from $\frac{1}{4}$ to 60 h. p. The great flexibility of frame sizes and windings makes it possible to design a Watson motor to meet any service requirement.



HORIZONTAL MOTOR
Squirrel cage type

High Resistance Squirrel Cage Motors—Combine high starting torque with comparative low inrush current and should be used where maximum power is required for short time ratings.



SLIP RING MOTOR
Ball bearing equipped, fully enclosed

means of a resistance type controller.

Multispeed Motors—Have the same advantages in the alternating current field that speed variation by

field control has demonstrated for direct current. Both types of control give positive speeds regardless of the load. In construction these motors are similar to the squirrel cage type, but are provided with 2, 3 or 4 windings, each giving a different constant speed. Each winding is independent and speed changes are made by a drum switch. The ratings at the different speeds can be chosen for constant torque, constant horsepower or any combination of the two.

Direct Current Motors

Ratings—Watson direct current motors are built in 13 frame sizes for all standard voltages up to 600 volts. Shunt, series, compound, and compensated windings can be furnished at all standard and many special speeds. Range from $\frac{1}{4}$ to 15 h. p.



DIRECT CURRENT MOTOR

Shunt Motors—Designed for constant speed and constant load conditions.

Compensated Motors—Designed for adjustable speed service. By means of resistance type controller in shunt field circuit, the motor speed may be increased to 6 times normal. Also recommended for high speed ratings and for service where motor is subjected to wide fluctuations in voltage, sudden changes in load, severe momentary overloads, quick reversing duty, or other extreme conditions. Interpole windings insure sparkless commutation.

Series and Compound Wound Motors—Furnished with special windings for any type of drive.

Vertical Ball Bearing Motors—Both alternating current and direct current Watson vertical motors are equipped with ball bearings. Bearings selected are exceptionally large and oil lubricated. Bearing chambers are dustproof and waterproof.

Horizontal Ball Bearing Motors—Alternating current or direct current types can be supplied in all standard ratings. Extra large bearings, grease lubrication, dustproof, gritproof, and waterproof construction.



A.C. VERTICAL MOTOR
Tripod base and mushroom cover



ENCLOSED A.C. MOTOR
Solid housing and end brackets, gritproof and dustproof Watson-built ball bearings

MOTOR PROTECTION CO.

Manufacturers of Protective Devices for Electric Motors
CENTRAL FALLS, R. I.

Product

MOTOR PROTECTION SYSTEM.

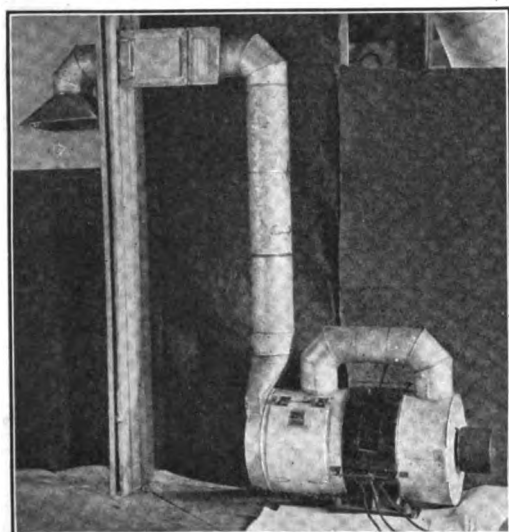
Dirt and Heat the Enemies of Motor Efficiency

Dirt and heat are the main causes of trouble with electric motors and are the destructive enemies of motor efficiency. Accumulation of dirt and the presence of heat so imperil the life of motors that it is hazardous to run them.

If satisfactory service is to be obtained, the utmost care is therefore necessary with motors that are subject to either of these two conditions.

Difficulty of Eliminating Dirt and Heat from Motors

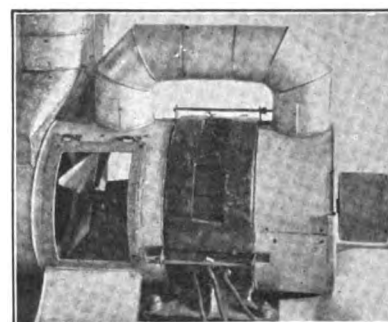
The common practice of most motor users, in their effort to eliminate dirt and heat, is to use hand bellows or compressed air. Both of these processes are at best only partially effective and are very expensive. Oily dirt becomes so tightly packed into motors that no amount of blowing will eliminate it. In fact, the very



SHOWING METHOD OF BRINGING IN FRESH AIR
TO PROTECTED MOTOR

act of blowing air at it tends to make it more difficult to eliminate.

However, cleaning motors can be overcome now by the application to them of a system especially arranged for eliminating dirt and heat.



SHOWING FAN ON MOTOR, DOOR OPEN

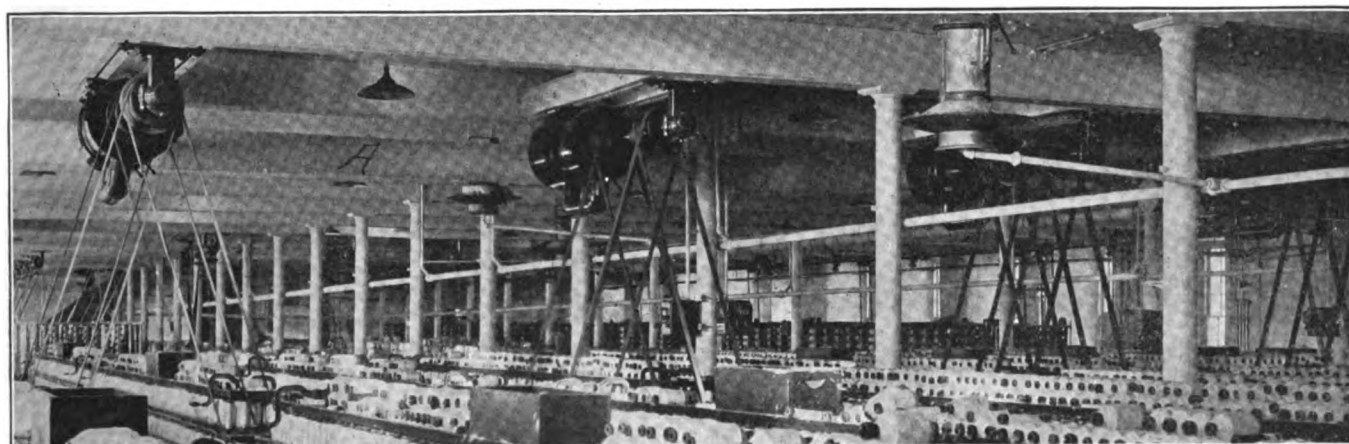
Solving the Motor Cleaning Problem

The motor protection system is a reliable one to apply to motors that are operated in places where dirt and heat must be eliminated. This system protects the motors and allows them to run in a cool and clean condition. Being enclosed the motors are kept clean, and they are kept cool by a fan pulling air from outside the building.

Outstanding Advantages—In addition to the above, the motor protection system accomplishes the following:

- Prevents motors burning out, when not defective.
- Keeps out dirt, dust and lint.
- Protects motor in case of fire.
- Allows motors to be run overloaded.

Construction and Operation—The equipment is made of galvanized iron. There are two hoods, one to cover the front of the motor and one to cover the rear. From the front hood a pipe is run to the outside air, usually through a window or wall. To the armature shaft of the motor a fan is attached and is arranged so that, as it runs with the motor, it draws cool, clean air from the outside and blows it through the motor. The two hoods are connected by a by-pass which allows the air being blown into the motor, to circulate all through it. On the intake pipe there is an air mixer which eliminates condensation which might occur when cold air comes in contact with the warm pipe. In addition, this feature cleanses the air before it enters the motor.



A COMPLETE MOTOR PROTECTION INSTALLATION IN THE TECUMSEH MILLS, FALL RIVER, MASS.

HABIRSHAW ELECTRIC CABLE CO., INC.

JOHN B. JOHNSTON AND JOHN S. WORLEY, RECEIVERS

Manufacturers of Wires and Cables

YONKERS, N. Y.

Products

INSULATED ELECTRIC WIRES and CABLES.

HABIRSHAW
"Proven by the test of time"
Insulated Wire
TRADE-MARK

insulation, one saturated braid, two saturated braids, or rubber filled tape and one saturated braid as shown in table.
Type letter, R.

General

Practically every kind of insulated electric wire and cable for the utilization, distribution and transmission of electrical energy, except weatherproof and slow burning.

Data concerning the use of a few types most commonly employed for house wiring, industrial application and for transmission purposes are given below.

Many other kinds of wire are made by this company. Additional information furnished on request.

Code House Cable, Single Conductor, Stranded

Used in pairs for house wiring or with twin wires for the neutral of 3-wire systems.

Number of conductors, one. Range of sizes, No. 14 A.W.G. and all larger sizes, stranded. Insulation, "black core" rubber compound. Covering over



CODE HOUSE CABLE, SINGLE CONDUCTOR, STRANDED

Size, cir. mils or A. W. G.	Number of strands concentric	Thickness insulation, 64ths in.	Diameter over braid, in.	Weight per 1000 ft., lbs.	Type of package	Feet in package	Shipping weight of package, lbs.
ONE BRAID							
8	7	3	.29	81	10 coils in case	5000	455
10	7	3	.24	57	10 coils in case	5000	315
12	7	3	.22	42	10 coils in case	5000	215
14	7	3	.20	31	10 coils in case	5000	175
DOUBLE BRAID							
8	7	3	.34	91	10 coils in case	5000	505
10	7	3	.27	67	10 coils in case	5000	365
12	7	3	.25	50	10 coils in case	5000	290
14	7	3	.23	39	10 coils in case	5000	235

TAPE AND BRAID

2,000,000	127	8	2.00	6900	*	*	*
1,750,000	127	8	1.90	6079	*	*	*
1,500,000	91	8	1.79	5251	*	*	*
1,250,000	91	8	1.66	4445	*	*	*
1,000,000	61	7	1.50	3556	Reel	500	2238
950,000	61	7	1.47	3385	*	*	*
900,000	61	7	1.44	3223	Reel	500	2072
850,000	61	7	1.41	3050	*	*	*
800,000	61	7	1.37	2888	Reel	500	1904
750,000	61	7	1.34	2705	Reel	500	1733
700,000	61	7	1.31	2554	Reel	500	1657
650,000	61	7	1.27	2388	*	*	*
600,000	61	7	1.24	2215	Reel	500	1488
550,000	61	7	1.20	2049	*	*	*
500,000	37	6	1.09	1805	Reel	1000	2265
450,000	37	6	1.04	1640	Reel	1000	2100
400,000	37	6	1.00	1477	Reel	1000	1937
350,000	37	6	.95	1302	Reel	1000	1682
300,000	37	6	.90	1133	Reel	1000	1513
250,000	37	6	.84	962	Reel	1000	1342
0000	19	5	.77	807	Reel	1000	987
000	19	5	.71	656	Reel	1000	836
00	19	5	.66	535	Reel	1000	715
0	19	5	.61	438	Reel	1000	518
1	19	5	.57	350	Reel	1000	430
2	7	4	.50	284	Reel	1000	364
3	7	4	.47	234	*	*	*
4	7	4	.44	194	Coil	500	102
5	7	4	.41	161	*	*	*
6	7	4	.38	136	Coil	500	73

*Special packing as specified.

Code House Wire, Single Conductor, Solid

Used in pairs for house wiring or with twin wires for the neutral of 3-wire systems.

Number of conductors, one. Range of sizes, No. 0000 to 14 A.W.G., solid. Insulation, "black core" rubber compound.

Covering over insulation, one saturated braid, two saturated braids, or rubber filled tape and one saturated braid as shown in table.

Type letter, R.

CODE HOUSE WIRE, SINGLE CONDUCTOR, SOLID

Size, A. W. G.	Outside diameter, in.	Thickness of insulation, 64ths in.	Weight per 1000 ft., lbs.	Type of package	Feet in package	Shipping weight of package, lbs.
ONE BRAID						
8	.27	3	76	10 coils in case	5000	430
10	.23	3	54	10 coils in case	5000	310
12	.21	3	40	10 coils in case	5000	240
14	.20	3	30	10 coils in case	5000	170
TWO BRAIDS						
8	.32	3	86	10 coils in case	5000	480
10	.26	3	63	10 coils in case	5000	345
12	.24	3	48	10 coils in case	5000	280
14	.23	3	38	10 coils in case	5000	210
TAPE AND BRAID						
000.0	.70	5	767	*	*	*
000	.65	5	623	*	*	*
00	.61	5	508	*	*	*
0	.57	5	415	*	*	*
1	.53	4	340	*	*	*
2	.47	4	268	*	*	*
3	.44	4	221	*	*	*
4	.41	4	184	*	*	*
5	.39	4	153	*	*	*
6	.37	4	129	*	*	*

*Special packing as specified.

Code House Wire, Twin (Flat), Solid

Used for the same purpose as stranded twin code house wire.

Number of conductors, two. Range of sizes, No. 6 to 14 A.W.G. Insulation on each conductor, "black core" rubber compound.

Covering over insulation, one saturated braid.

Grouping of conductors, parallel. Covering over all, one saturated braid.

CODE HOUSE WIRE, TWIN (FLAT), SOLID

Size, A. W. G.	Thickness of insulation, each conductor, 64ths in.	Outside diameter in.	Weight per 1000 ft., lbs.	Type of package	Feet in package	Shipping weight of package, lbs.
6	4	.38x.71	261	*	*	*
8	3	.32x.58	169	5 coils in case	2500	470
10	3	.26x.49	118	5 coils in case	2500	340
12	3	.24x.44	87	10 coils in case	5000	485
14	3	.22x.41	68	10 coils in case	5000	390

*Special packing as specified.

Park Cable

Used for transmission and distribution where it is preferable to bury the cables directly in the ground rather than to put them in ducts. Any kind of cable will be furnished with park cable covering, but the following types are in general use for distribution purposes:

Standard park cables (0-600 volts): number of conductors, one to three. Insulation on each conductor, "black core" rubber compound. Covering over insulation, rubber filled tape. Covering over tape, lead sheath. Covering over lead sheath, asphalt jute.

Protective armor, two galvanized steel tapes wound in the same direction, the outer tape covering the spaces between turns of the inner tape.

Outside covering, asphalted jute.

Upon receipt of inquiry stating conditions of service, the engineering department of this company will furnish additional data.



PARK CABLE

Lead Covered Cable, Single Conductor, Stranded, 0 to 600 Volts

Similar to solid single conductor lead covered wire except that it has greater flexibility and is made in larger sizes.

Number of conductors, one. Range of sizes, No. 14 A.W.G. to 2,000,000 C.M., stranded. Insulation, "black core" rubber compound. Covering, one rubber filled tape or braid. Covering over all, lead sheath.

Type letter, R. L.

LEAD COVERED CABLE, SINGLE CONDUCTOR

Size, circ. mils or A. W. G.	Number of strands concentric	Thickness of insulation, 64ths in.	Thickness of lead sheath, 64ths in.	Diameter over lead, in.	Weight per 1000 ft., lbs.	Type of package	Feet in package	Shipping weight of package, lbs.
2,000,000	127	8	7	2.14	10171	Reel	1000	11178
1,750,000	127	8	7	2.03	9184	Reel	1000	10189
1,500,000	91	8	7	1.92	8171	Reel	1000	9186
1,250,000	91	8	7	1.79	7166	Reel	1000	7816
1,000,000	61	7	6	1.60	5616	Reel	1000	6266
950,000	61	7	6	1.57	5404	Reel	1000	6054
900,000	61	7	6	1.54	5201	Reel	1000	5851
850,000	61	7	6	1.51	4985	Reel	1000	5635
800,000	61	7	6	1.47	4781	Reel	1000	5431
750,000	61	7	6	1.44	4572	Reel	1000	5222
700,000	61	7	6	1.41	4354	Reel	1000	5004
650,000	61	7	6	1.37	4141	Reel	1000	4791
600,000	61	7	6	1.34	3918	Reel	1000	4378
550,000	61	7	6	1.30	3701	Reel	1000	4161
500,000	37	6	5	1.20	3108	Reel	1000	3568
450,000	37	6	5	1.15	2904	Reel	1000	3364
400,000	37	6	5	1.11	2678	Reel	1000	3138
350,000	37	6	5	1.06	2449	Reel	1000	2829
300,000	37	6	5	1.01	2220	Reel	1000	2600
250,000	37	6	5	.96	1984	Reel	1000	2364
0000	19	5	4	.85	1529	Reel	1000	1909
000	19	5	4	.79	1324	Reel	1000	1504
00	19	5	4	.74	1156	Reel	1000	1336
0	19	5	4	.69	1016	Reel	1000	1196
1	19	5	4	.65	900	Reel	1000	1080
2	7	4	4	.58	757	Reel	1000	837
3	7	4	4	.55	678	Reel	1000	758
4	7	4	4	.52	612	Reel	1000	692
5	7	4	4	.49	555	Reel	1000	635
6	7	4	4	.47	508	Reel	1000	588
8	7	3	3	.37	306	Reel	1000	361
10	7	3	3	.34	259	Reel	1000	304
12	7	3	2	.28	156	Reel	1000	211
14	7	3	2	.26	137	Reel	1000	192

Lead Covered Cable, Twin (Flat), Stranded, 0-600 Volts

Used under the same conditions as stranded single conductor lead covered wire.

Number of conductors, two. Range of sizes, No. 0000 to 14 A.W.G., stranded. Insulation on each con-

ductor, "black core" rubber compound. Covering over insulation, one rubber filled tape or braid. Grouping of conductors, parallel.* Covering over all, lead sheath. Type letter, R.D.L.

LEAD COVERED CABLE, TWIN (FLAT)

Size, A. W. G.	Number of strands concentric	Thickness of insulation, 64ths in.	Thickness of lead sheath, 64ths in.	Diameter over lead, in.	Weight per 1000 ft., lbs.	Type of package	Feet in package	Shipping weight of package, lbs.
0000	19	5	5	.87x1.59	3065	Reel	1000	3445
000	19	5	5	.82x1.47	2622	Reel	1000	3002
00	19	5	5	.76x1.37	2300	Reel	1000	2680
0	19	5	5	.72x1.28	2030	Reel	1000	2410
1	19	5	5	.68x1.20	1771	Reel	1000	2151
2	7	4	4	.58x1.02	1298	Reel	1000	1478
3	7	4	4	.54x.96	1160	Reel	1000	1310
4	7	4	4	.52x.90	1027	Reel	1000	1207
5	7	4	4	.49x.85	920	Reel	1000	1000
6	7	4	4	.47x.81	844	Reel	1000	924
8	7	3	3	.37x.64	504	Reel	1000	584
10	7	3	3	.34x.58	427	Reel	1000	507
12	7	3	3	.31x.53	368	Reel	1000	423
14	7	3	2	.26x.46	233	Reel	1000	288

Paper Insulated Cables

Used for underground transmission and distribution for which they enjoy the advantage of cheapness, durability, low dielectric losses, low electrostatic capacity and high current carrying capacity.

Insulation consists of Manila paper applied helically to the conductor, and then saturated with a mineral oil compound which constitutes the essential insulation. In order to retain this oil, the cable must have an oil-proof covering which is almost invariably a sheath of lead.

As the electrostatic capacity and dielectric losses of paper insulated cables are considerably lower than those of other types, they are especially suitable for long transmission lines.

Habirshaw paper insulated cables have particularly low dielectric losses without sacrifice of dielectric strength. Great care is also taken to make the cable flexible at all temperatures at which it is likely to be operated.

Paper insulated cables are made in all sizes from No. 6 A.W.G. to 2,000,000 circular mils and with any number of conductors within the usual limits.

Upon receipt of inquiry stating conditions of service, the engineering department of this company will furnish further data.

Field Engineering Service

Habirshaw maintains a field engineering service for the benefit of customers and prospective customers. Whenever there is any doubt as to the type of wire or cable which will best fulfill the requirements of any given set of conditions, the engineering department of this company is prepared to send a representative to investigate and make recommendations.

Studies of the service conditions of various industries in which electrical power is used are constantly being made so that Habirshaw engineers are in active touch with the latest tendencies and most modern installations.

Research Laboratories—Habirshaw also maintains fully equipped electrical, chemical and mechanical research laboratories in which problems of structure and manufacture are studied. The facilities of these laboratories are at the service of those whose problems require this method of treatment. Here also many researches are carried on for the purpose of advancing the art of insulated wire and cable manufacture.

*Round cable with two conductors twisted will be furnished when specified.

AMERICAN STEEL & WIRE COMPANY

Manufacturers of Electrical Wires and Cables

SALES OFFICES

CHICAGO, 208 South La Salle Street
 NEW YORK, 30 Church Street
 WORCESTER, 94 Grove Street
 BOSTON, 185 Franklin Street
 PHILADELPHIA, Widener Building
 PITTSBURGH, Frick Building
 BUFFALO, 337 Washington Street
 DETROIT, Foot of First Street
 CINCINNATI, Union Trust Building

CLEVELAND, Western Reserve Building
 BALTIMORE, 32 South Charles Street
 WILKES-BARRE, PA., Miners Bank Building
 ST. LOUIS, MO., Liberty Central Trust Co. Building
 ST. PAUL-MINNEAPOLIS, Pioneer Building, St. Paul
 KANSAS CITY, MO., 417 Grand Avenue
 OKLAHOMA CITY, First National Bank Building
 BIRMINGHAM, ALA., Brown-Marx Building
 DENVER, First National Bank Building

SALT LAKE CITY, Walker Bank Building

EXPORT REPRESENTATIVES

UNITED STATES STEEL PRODUCTS Co., 30 Church Street, New York

PACIFIC COAST REPRESENTATIVES

UNITED STATES STEEL PRODUCTS Co., San Francisco, Los Angeles, Portland, Seattle

Products

BARE WIRES and CABLES for Telephone, Telegraph, Street Railway and Long Distance Power Transmission purposes, Copper, Iron and Steel; also

W. & M. Telephone and	Theater or Stage Cables
Telegraph Wire	Automobile Ignition Wires and Cables
Rail Bonds	
Resistance Wire	Rubber Covered Wires and Cables
Armature Binding Wire	
Pole Steps	Switchboard Cables
Magnet Wire	Industrial Plant Wiring
Annunciator and Office	Car Cables
Wire	Fireproof Cables
Weatherproof Wires and	Flat Steel Taped Cables
Cables	Mining Machine Cables
Slow Burning Wires and	Signal Wires and Cables
Cables	Paper Insulated Lead
Lamp Cord	Sheathed Cables
Reinforced Portable Cord	Varnished Cambric Cables
Brewery Cord	Submarine Cables
Canvasite Cord	Appliances for Installing
Border Light Cables	Cables
Deck Cables	End Bells for Cables
Elevator Lighting and Con-	Manhole Racks for Cables
trol Cables	

For Wire Rope, see page 52; for Concrete Reinforcement, see page 80.

Facilities

The company's extensive factory facilities are well equipped with chemical, physical, and electrical laboratories, wherein the problems incident to the solution of every difficulty encountered are handled by thoroughly reliable experts and up-to-date methods. All steel and copper used are rolled and drawn in the mills and are under the company's supervision throughout every operation.

All raw materials are tested and inspected before being used; the manufacturing processes are constantly checked, and finally the finished material is subjected to an exhaustive series of tests that determine beyond question whether or not it is of proper quality. With such facilities, this company is enabled to manufacture electrical conductors of all kinds to the severest specifications and to give the users of the product a standard of quality that is unexcelled.

Bare Wires and Cables—Copper, Iron and Steel

Copper wire for all purposes in any required shape or size; for telephone and telegraph, high voltage long distance transmission, and industrial purposes in general. Copper cables of all capacities and degrees of flexibility, hard drawn or annealed, bare or insulated.

Galvanized iron and steel wire is also made in all shapes and sizes, bare or insulated, and for all purposes; telephone and telegraph wires, armor wires, strand and wire rope of all kinds.

Magnet Wire

All magnet wire is thoroughly annealed by processes which insure uniform and extreme softness, highest conductivity and ease of handling. Before cover is applied all wire is carefully inspected for size, uniformity of dimensions, freedom from scale and all surface imperfections.

Large quantities of the ordinary commercial sizes of cotton covered magnet wire are produced, as well as fine and special work, silk and cotton. Magnet wire is covered with single, double or triple cotton or silk, asbestos, cotton and paper.

Weatherproof and Slow Burning Wires and Cables

These have moderate degree of insulation and are less expensive than rubber insulated conductors. Double and triple braid. Reliance weatherproof wire meets every requirement for outdoor service, while Reliance slow burning wire is superior for indoor uses.

Wires and cables are made in strict accordance with all requirements of the National Board of Fire Underwriters, sizes varying from No. 20 B. & S. to the largest feeder cables used. Sizes No. 4/0 B. & S. and smaller are usually made of solid wires, while larger sizes have stranded conductors.

Unless hard drawn copper be specified, wires of purest grade of annealed copper, uniform in softness and having minimum conductivity of 98% Mattiessen's standard, will be used.

Americore Rubber Covered Wires and Cables

Used for general interior light and power wiring.

The conductor consists of uniformly soft annealed commercially pure copper wire, insulated with code thickness of high grade vulcanized rubber protected with closely woven, strong, and elastic cotton braids saturated in waterproof compound.

All conductors are thoroughly and evenly coated with tin to protect the copper from any injurious effect from the sulphur in the rubber insulation.

DAHLSTROM METALLIC DOOR COMPANY

Manufacturers of Metal Bases, Door Frames and Interior Trim

CABLE ADDRESS
"DAHLSTROM JAMESTOWN"

433 Buffalo Street
JAMESTOWN, N. Y.

NEW YORK OFFICE, 25 Broadway

DETROIT OFFICE, 1331 Dime Bank Building
BRANCH OFFICES IN ALL PRINCIPAL CITIES

CHICAGO OFFICE, 19 South La Salle Street

Products

METAL CONDUO-BASE; INTERIOR METAL FINISH for Railway Coaches; CEILING LIGHTS; UNI-TRE FRAMES.

Also manufacturers of Fume Hoods, Radiator Hoods and all kindred products in metal.

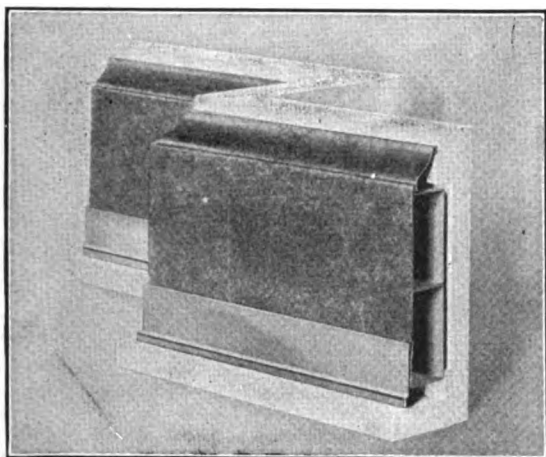


boxes, etc., of all prefixed outlets as well as the cost of large wire moulds for low tension wires. It eliminates unsightly exposed wires tacked around wall trim. The cost of constant changes for each new tenant's requirements and the cost of cutting and patching walls and floors for each change is reduced to a minimum.

Conduo-Base

A metal base, for the office building, school, hospital, hotel or apartment building which carries both high and low tension wires, in concealed raceways.

This base has a removable face. When a change in wiring is necessary it only requires removing the face



CONDUO-BASE

and selecting the desired wire. A notch is then made in the face, the receptacle inserted and the face replaced. This method eliminates the tearing up of walls and floors to reach desired wires. There are no loose wire ends exposed.

Conduo-Base eliminates the guesswork as to future tenants' wiring requirements; the necessity of determining beforehand the exact outlets before the offices are rented; the cost of extensive conduits and wires, outlet

Finish for Railway Cars

Interiors of the first steel sleepers, diners, private cars and day coaches were developed and built at the Dahlstrom plant. Our equipment is unsurpassed.

Special Ornate Ceiling Lights

A most striking installation is the Chester Water Side Station, Chester, Pa. These lights span practically the entire roof 80 ft. above the floor.

Uni-tre Frames

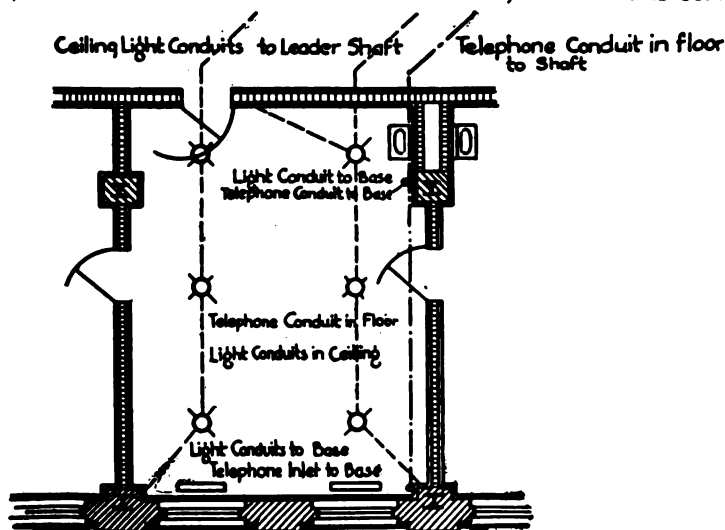
Made of high grade cold rolled sheet steel of proper gauge for size and condition of openings. May be used with equal advantage with wood or metal doors. The frame is set as soon as floor arches are in, and walls, floors and ceilings are built up around it—saving time and expense in erection.

Cut-outs for hardware are made to template before forming. All reinforcing for hardware included in fabrication work. The prime coat which is baked on serves as an excellent ground coat for final finish. Frames can be shipped completely finished if conditions warrant.

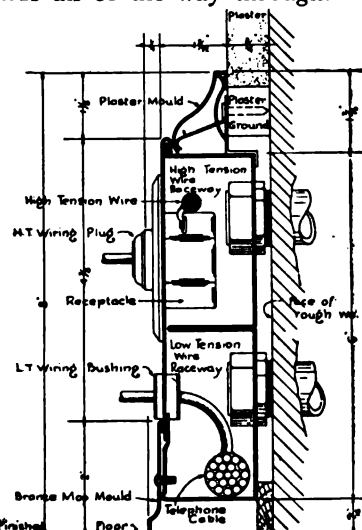
Services

We will send to architects, building engineers and contractors designs for these items of construction.

Dahlstrom service begins when you call on us. We help design units best adapted to the requirements and this service extends all of the way through.



TYPICAL OFFICE LAYOUT WITH CONDUO-BASE



CROSS SECTION DETAIL OF CONDUO-BASE

FRANK ADAM ELECTRIC CO.

GENERAL OFFICE AND FACTORY

3650 Windsor Place

ST. LOUIS, MO.

(Mail Address, 3649 Bell Avenue)

BRANCH OFFICES

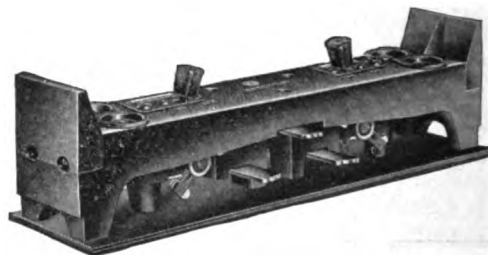
DETROIT, MICH., 522 Brush Street
CINCINNATI, OHIO, 605 Mercantile Library Building
NEW ORLEANS, LA.
KANSAS, CITY, MO., 828 New York Life Building

DALLAS, TEX., 222 Interurban Building
MINNEAPOLIS, MINN., 442 Builders Exchange
CHICAGO, ILL., 514 Harris Trust Building
SAN FRANCISCO, CAL., 583 Howard Street

Products

Full and complete line of : LIVE FACE PANELBOARDS and CABINETS, SAFETY PANELBOARDS and CABINETS, METER CONTROL PANELBOARDS and CABINETS, ALTERNATING and DIRECT CURRENT SWITCHBOARDS, SAFETY SWITCHES; FAN HANGER OUTLETS; ADJUSTABLE FLOOR BOXES, THEATRE SWITCHBOARDS.

Also a complete line of Slate Base Fuse Blocks, Knife Switches.



THE "T-P" UNIT

Engineering Service

The Engineering Department of the FRANK ADAM ELECTRIC Co. is at the disposal of engineers for proper design and specifications of special control for electric light and power wiring and apparatus. Requests for services are solicited. Special Theatre Lighting Division.

Catalogue

Catalogue No. 25 fully lists, illustrates and describes entire line of standard products.

Panelboards and Cabinets

Besides the regular complete line of light and power distribution, panelboards and cabinets, both live face and dead front, we have the "FA" "Triumph" type "T-P" panelboards with cabinets, which are the result of many years' development and knowledge of actual conditions under which panelboards and cabinets must be installed and operated.

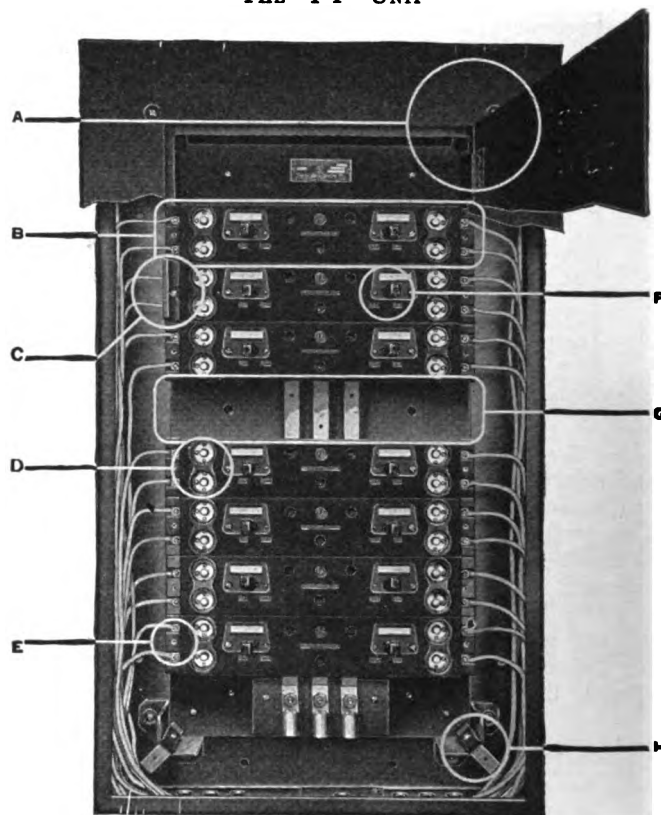


TRADE-MARK

The "T-P" is the first sectional constructed panelboard to give absolute safety with a one-door opening. Also made in standard two-door construction. The "T-P" unit is one complete piece carrying both switches and fuses inside the barrier pieces. The barriers completely cover and conceal the terminals. This makes a board that is absolutely dead face when the branch switches are off, and perfectly safe at all times.

The material of which each unit is constructed is a moulded composition structure, without holes, flaws or mineral veins, and weighs less than slate or marble.

The branch switches are "FA" standard D.P. 30-ampere 250-volt tumbler switches of rugged construction for panelboard service.



NEW "TRIUMPH" TYPE "T-P" PANELBOARD

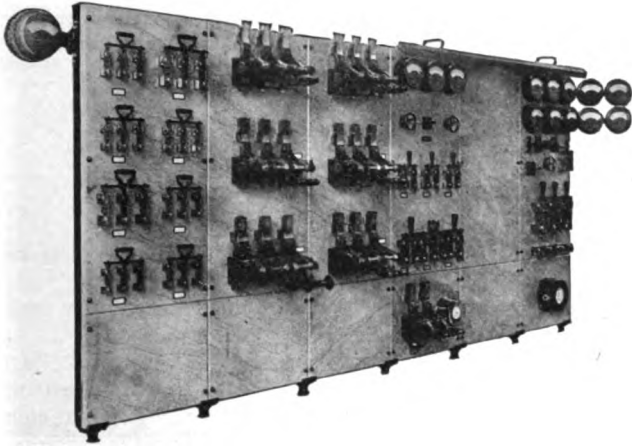
- A—An absolutely safe one-door panelboard.
- B—Two-circuit unit construction.
- C—Barriers, entirely cover and conceal terminal connection.
- D—Standard fuse plug equipment.
- E—Terminals easily accessible.
- F—Heavy duty 30-ampere tumbler switches.
- G—Easy replacement of unit without disturbing other units or balance of panel.
- H—Patented corner supports.

End section covers main lugs (top or bottom).

The above cut illustrates the fact that the Triumph line ("T-P" type) of panelboards is unique and the last word in panelboard construction, and the examination of the finished panelboard will demonstrate the rugged construction and standardization of manufacture of every part of the panelboard and cabinet, with the usual "FA" features for easy installation, which means a low first cost for manufacturing and installing, with long life for service.

Switchboards

Besides a complete line of alternating and direct current generator switchboards, we build special feeder switchboards for both light and power, in accordance with specifications submitted.



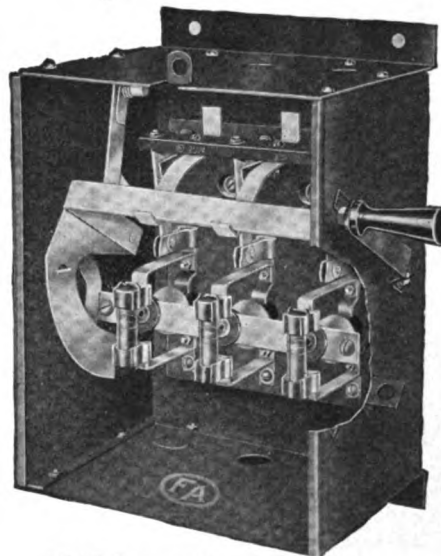
"FA" ONE TYPE OF SWITCHBOARD

Safety Motor-starting Switch

The "FA" safety switch is a fused starting switch, intended for use with alternating current squirrel cage motor which may be thrown directly across the line. The motors are usually of 5 h.p. capacity and smaller, although the switch itself is of sufficient capacity to handle a motor as large as $7\frac{1}{2}$ h.p., 250 volt, or 15 h.p., 500 volt.



"FA" SAFETY SWITCH WITH DOOR CLOSED



"FA" SAFETY SWITCH WITH COVER REMOVED

Note ease with which all connections can be made

The switch is entirely enclosed within a code gage steel box which is arranged for wall mounting. Knock-outs for conduit connections are provided at the top and bottom of the box and it is fitted with a sliding door.

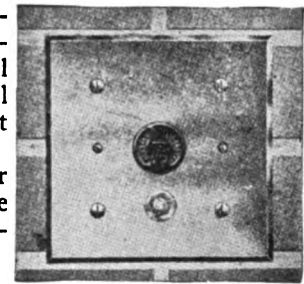
Fan Hanger Outlets

The "FA" No. 4455 hanger outlets were designed and made especially for fan service, but readily lend themselves as a utility outlet for heaters, various other electrical appliances and for fine framed pictures that require lighting. They are adaptable to all classes of

modern buildings, where safety as well as efficiency is desired. They eliminate wall brackets, standards and all temporary installations that are dangerous and unsightly.

They are permanent for they are built in at the same time as the rest of the service equipment.

Description—"FA" hanger outlets are made of a special code gage steel box $4 \times 4 \times 2\frac{1}{4}$ in., with substantial supports to which the inside adjustable plate is fastened with screws, and a finished cover of $\frac{3}{32}$ in. brass 5 in. square with beveled edges furnished with four brass screws $1\frac{1}{4}$ in. long to take up the variation in the thickness of plaster. The inside adjustable cover permits adjustment to plumb the finished cover as shown in illustrations. The finished cover has a standard flush receptacle in the center, of the proper size for a standard interchangeable plug. Attached to the center of the plate at the lower side is a $\frac{1}{4}$ -in. steel machine threaded bolt, with nut and washer for attaching the fan.



FAN HANGER OUTLET

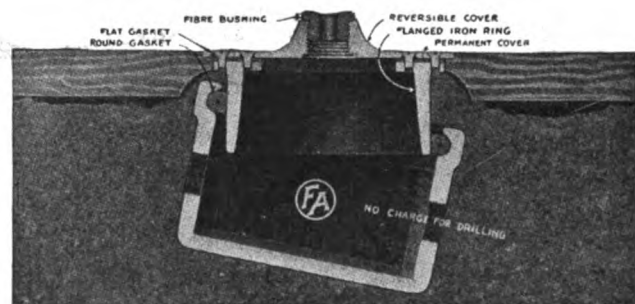


SHOWING FAN IN POSITION

Floor Boxes

"FA" adjustable floor boxes, No. F.B.453S are made for cement and granolithic type floor work. One cover fits both "in use" and "future use" conditions by being reversible. Flanged iron ring with cover is readily adjustable for a variation of $\frac{3}{4}$ in. Also made special for greater variation and is made a permanent part of box and floor by means of a fine cement mortar groating.

The reversible cover when not in place leaves a clear opening of 3 in. for connecting wires and installing receptacle. Any standard flush receptacles with ears removed can be installed by means of special steel hangers furnished with box. $4\frac{3}{4}$ in. square, $3\frac{1}{4}$ in. deep; will take three $\frac{3}{4}$ -in. or two 1-in. pipes in one side.



SECTIONAL VIEW OF "FA" ADJUSTABLE FLOOR BOX

MUTUAL ELECTRIC & MACHINE CO.

Manufacturers of Electrical Controlling Devices

DETROIT, MICH.

Products

"BULL DOG" SWITCHBOARDS, PANELBOARDS, CABINETS and SAFETY SWITCHES.

Also manufacturers of Knife Switches, Fuse Clips and parts.

Underwriters' Approval

"Bull Dog" apparatus is approved and listed by the Underwriters' Laboratories, Inc., under rules and requirements of the National Board of Fire Underwriters.



TRADE-MARK

The "preset" type levers have 4 positions, "on," "off," "independent operation" and "positive interlocking," all connected by master levers.

"Bull Dog" Super-safety dead face theater switchboards are simple in construction and positive in operation. No live electrical parts are exposed where the operator or other persons might accidentally come in contact with them.

All fuses and parts which may require replacement are easily and quickly accessible to the operator. These boards are compact, occupying a minimum amount of space and all parts are standardized. Costs of replacements and repairs are minimized.

The arrangement of the different switches, operation grouping and control is so arranged as not to be radically different from those on types of boards that the average operator is familiar with. Any experienced operator can quickly learn their operation.

Indorsements—"Bull Dog" Super-safety dead face theater switchboards have been in use in theaters from coast to coast, from the lakes to the gulf and in Canada between 5 and 12 years.

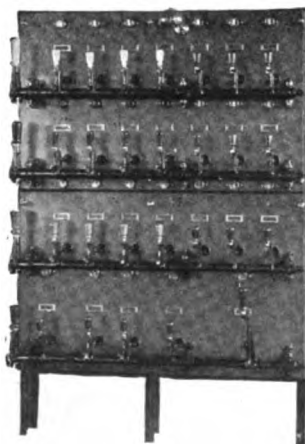
Architectural Co-operation—We will gladly co-operate with architects and engineers in laying out theater switchboards to meet their particular requirements.

"Bull Dog" Super-Safety Theater Stage Switchboards, Dead Face

Features have been incorporated in this type of switchboard that meet every requirement for theater stage and auditorium lighting.

Models may be of several designs in either "preset" or "not preset" types. With the "preset" type of switchboard, all switch levers can be "preset" so that the operator can provide the desired lighting effects for a scene to follow the one in action, and without disturbing the lighting effect of the scene in progress. With the switch levers preset the operator can throw off one scene and throw on the next immediately by the operating master lever.

A magazine panel mounted in rear of the board divides up the circuits controlled by each switch.



"BULL DOG" SUPER-SAFETY DEAD FACE THEATER SWITCHBOARD

Size of slate space required is 4 ft. wide by 5 ft. high, showing small space required for this switchboard. Side view shows over-all thickness of board and small space and depth required.

"Bull Dog" Super-Safety Panelboards and Cabinets

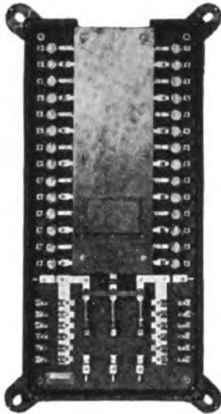
This type is known as the dead face type and is designed so that the switches may be operated without liability of coming in contact with live metal parts. Switches are of the 30-ampere 250-volt toggle type. Snap switch type panelboards are also included in the "Bull Dog" line.



"BULL DOG" DEAD FRONT PANELBOARD

"Bull Dog" Sealed Metering Panels

These metering panels are provided with a sealed compartment so that the changing of the metering circuits is under control of authorized persons.



"BULL DOG" SEALED METERING PANEL

"Bull Dog" Externally Operated Safety Switches

All parts are standardized. Removable and interchangeable end plates are a prominent feature.

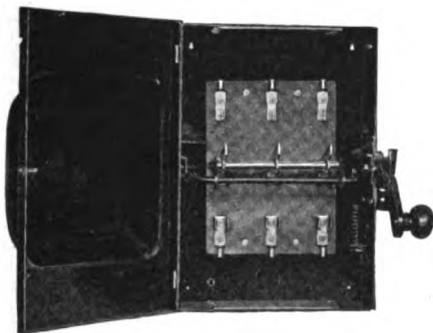
An unusually large number of knock-outs, well placed, meet any wiring condition.

The switch blades are actually strengthened by the connecting rod instead of being weakened as is usual in ordinary switches. The connecting rod is of "Mutualite," an exclusive "Bull Dog" feature not approached in insulating qualities by any other insulating material.

The switch jaws are of heavy "Bull Dog" Type A built-up construction. The strong blades and heavy switch jaws give a maximum contact. Quick break and positive make is provided for all operating switches over 30 to 600 amperes inclusive.

The switch can not be closed with the door open except by an experienced maintenance man. The door may be locked closed and the switch locked open with one or more locks. To inspect the switch without interrupting production, the door can be opened with a special key.

The operating handle and switch are of unit construction and may be removed and replaced without taking the box off the wall.

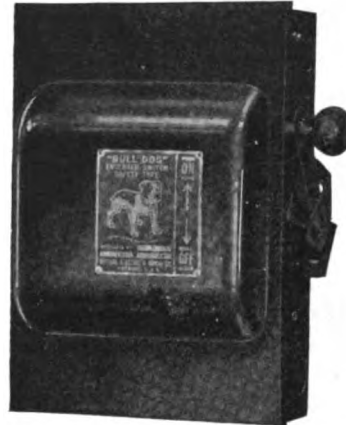


CABINET OPEN

The cabinet is attractive in appearance, roomy with plenty of space for working inside the box.

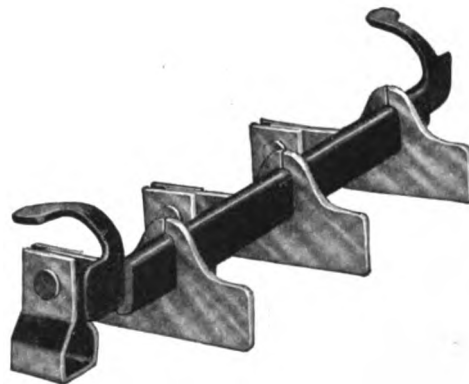
These switches are furnished in any capacity from 30 to 1200 amperes.

Operating Crossbar of Safety Type Switches—Particular attention is called to the method used in connecting the 30-ampere switch blades to the operating crossbar. It has been the general practice to weaken the blades by cutting into them, reducing the cross-sectional area and mechanical strength. Our method has been to reinforce them.



FRONT OF CABINET

The blades are swedged on to a steel cross member, which is reinforced and insulated with a new insulating material, "Mutualite." This insulation has continuously withstood a voltage in excess of 20,000 volts. "Mutualite" process was developed in Mutual factories. It will not chip, break by shock, is flexible, and has high dielectric qualities.



OPERATING CROSSBAR OF SAFETY TYPE SWITCHES

"Mutualite" is heat treated on steel until it becomes practically a solid member; it is highly resistant to moisture, vapor and oils.

Catalogues and Bulletins

Catalogues and bulletins descriptive of all "Bull Dog" controlling devices will be furnished on request.

BUSSMANN MANUFACTURING CO.

Manufacturers of Electric Fuses

ST. LOUIS, MO.

DEALERS AND DISTRIBUTORS IN EVERY PRINCIPAL CITY

Product

ELECTRIC FUSES, all types.

Buss Renewable Fuses

Ferrule Contact Type, 3 to 60 Amperes—Hands are all that are needed to renew these fuses. No fumbling or hunting for screwdrivers, etc. The full length cap gives large gripping surface for the hands.

Everything possible is done to insure good contact, thereby preventing charring of fiber tube. The full length cap, with unbroken surface, gives good contact in the fuse block clips; a recess in the cap takes the expelled metal and prevents it from injuring the contact points inside the cap; projection in cap insures a good contact with the link; cap being held by fuse block clips prevents vibration from loosening the contact.



FERRULE CONTACT
RENEWABLE FUSE

Knife Blade Type, 65 to 600 Amperes—End ring fastened *inside* the cartridge prevents shrinking or swelling of the fiber tube from having any effect on the operation or life of the fuses. Terminals are seated in metal grooves and can not possibly be out of line.



KNIFE BLADE RENEWABLE FUSE

Complete Fuses—All sizes are approved by the Underwriters' Laboratories, Inc., and labeled "Und. Lab. Inspected."

BUSS RENEWABLE FUSES

Amperes	Length over all, in.	Diameter tube, in.	Lbs. per 100	Standard package	List price
250-volt	3 to 30.....	2	1/4	6	100 \$ 0.50
	35 to 60.....	3	3/8	16	100 1.00
	65 to 100.....	5 1/2	1	48	50 2.00
	110 to 200.....	7 1/2	1 1/2	116	25 4.00
	225 to 400.....	8 1/2	2	235	25 7.50
	450 to 600.....	10 1/2	2 1/2	356	10 11.00
600-volt	3 to 30.....	5	3/4	19	100 1.10
	35 to 60.....	5 1/2	1	36	100 1.25
	65 to 100.....	7 1/2	1 1/4	74	50 3.00
	110 to 200.....	9 1/2	1 3/4	167	25 5.00
	225 to 400.....	11 1/2	2 1/4	462	25 11.00
	450 to 600.....	13 1/2	3	540	10 16.00

Renewal Links—Approved in all sizes by Underwriters' Laboratories, Inc., and stamped "Und. Lab. Insp." Identical in size and interchangeable with all standard makes of fuses.



RENEWAL LINK

BUSS RENEWAL LINKS

Amperes	Lbs. per 100	Standard package	List price
250-volt	3 to 30.....	12	100 \$0.03
	35 to 60.....	65	100 0.05
	65 to 100.....	75	50 0.10
	110 to 200.....	2.00	25 0.15
	225 to 400.....	4.00	25 0.30
	450 to 600.....	7.00	10 0.60
600-volt	3 to 30.....	.50	100 0.05
	35 to 60.....	1.70	100 0.06
	65 to 100.....	1.90	50 0.10
	110 to 200.....	6.00	25 0.15
	225 to 400.....	12.00	25 0.30
	450 to 600.....	20.00	10 0.60

SWEET'S CATALOGUE



TRADE-MARK

Buss Cartridge Non-renewable Fuses

Ferrule Contact Type, 3 to 60 Amperes—These sizes in the 250-volt range have no soldered joint on the inside. No inaccuracies or variations in manufacture are possible.



FERRULE CONTACT
NON-RENEWABLE FUSE

Knife Blade Type, 65 to 600 Amperes—Construction of Buss non-renewable cartridge fuses in knife blade



KNIFE BLADE NON-RENEWABLE FUSE

sizes is such as to always assure positive alignment of blades. All parts riveted; no screws to come loose or fall out. Fusible element is riveted and soldered.

The strip as shown is an exclusive Buss feature and



ILLUSTRATING STRIP USED IN NON-RENEWABLE FUSES

used in all Buss non-renewable cartridge fuses from 8 to 1000 amperes. This strip has been on the market three years; has thoroughly demonstrated that it makes the Buss fuse the coolest operating fuse, and enables us to guarantee that each and every Buss fuse will not burn or char the fiber tube at any overload.

Approved by the Underwriters' Laboratories, Inc., and labeled "Und. Lab. Inspected" except sizes larger than 600 amperes, which are not tested by them.

BUSS NON-RENEWABLE FUSES

Amperes	Length, over all, in.	Diameter tube, in.	Lbs. per 100	Standard package	List price
250-volt	1 to 30.....	2	1/4	4.5	100 \$ 0.20
	35 to 60.....	3	3/8	11.0	100 0.30
	65 to 100.....	5 1/2	1	31.0	50 0.90
	110 to 200.....	7 1/2	1 1/4	80.0	25 2.00
	225 to 400.....	8 1/2	2	160.0	25 3.60
	450 to 600.....	10 1/2	2 1/4	275.0	10 5.50
	650 to 800.....	11 1/2	3	430.0	10 12.00
	850 to 1000.....	12 1/2	3	540.0	10 15.00
600-volt	1 to 30.....	5	3/4	15.0	100 0.40
	35 to 60.....	5 1/2	1	25.0	100 0.60
	65 to 100.....	7 1/2	1 1/4	55.0	50 1.50
	110 to 200.....	9 1/2	1 3/4	120.0	25 3.00
	225 to 400.....	11 1/2	2 1/4	290.0	25 5.50
	450 to 600.....	13 1/2	3	430.0	10 8.00
	650 to 800.....	14 1/2	3	540.0	10 15.00
	850 to 1000.....	15 1/2	3	725.0	10 18.00

"Buss" Plug Fuses

Guaranteed clear window, so user can tell which fuse is blown. Approved by Underwriters' Laboratories, Inc.

BUSS PLUG FUSES

Amperes	Catalogue No.	List Price
3	803	\$0.07
6	806	
10	810	
12	812	
15	815	
20	820	
25	825	
30	830	

Packed 10 in a carton, 200 in standard package. Shipping weight, 75 lbs. per 1000.



BUSS PLUG FUSE

CHICAGO FUSE MFG. COMPANY

Manufacturers of Fuses, Fuse Plugs, Switch and Outlet Boxes, Cut-outs

Lafin and 15th Streets

CHICAGO, ILL.

EASTERN OFFICE: 105 West 40th Street, NEW YORK, N. Y.

Products

RENEWABLE and NON-RENEWABLE ENCLOSED FUSES; SWITCH and OUTLET BOXES and COVERS.

Also manufacturers of Automobile Fuses, Fuse Plugs, Cut-out Bases.

"Union" Renewable and Non-renewable Fuses

Both the renewable and non-renewable types have the unqualified approval of the National Board of Fire Underwriters in all sizes of N. E. C. Standard dimensions for both 250- and 600-volt service, and bear their inspection label.

Description—The tubes of "Union" fuses are made of special extra thick fire-resisting fiber of unusual strength.

Ferrules of the knife blade type, which form one piece with the caps, are screwed to the outside of tube and permanently fastened in the right position by a rivet, insuring permanent alignment of the blades. In renewing, this connection to the tubing is not disturbed, as all changes are made between the long wearing metal surfaces.

The flexibility of the knife blade fastenings allows the blades to readily adjust themselves in the mounting clips, and so make good contact. Both knife blades are in perfect alignment. This prevents overheating of terminals, preventing possible destruction of fuse.

The yoke is riveted to the knife blade, forming a rigid baffle plate. Washers are heavy die-cut pieces accurately slotted so they can be easily lifted off with the fingers.

There is no flash or violent explosion when the fuse blows. Metal parts can not fuse as they are treated by a special process that prevents it.

In addition, the fusing point in the link is in the center, too far from metal parts to enable heat and gases to fuse and corrode them.

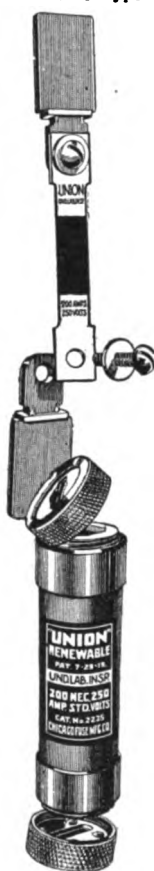
Arcing and electro-metallic deposits can not occur, because the entire center of the link melts completely when a fuse blows and leaves a wide space.

We put vents, or "safety valves," in the ends of sizes that might require them, to permit gases to escape quickly.

The simple construction, with lack of intricate parts, makes the "Union" the easiest and quickest fuse to renew.



Ferrule Type



Knife Blade Type
"UNION"
RENEWABLE
FUSES

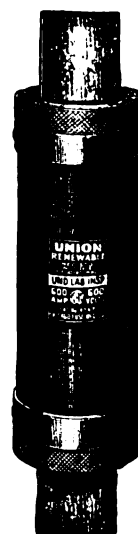
Links of the ferrule type are supplied with one end bent to save time and insure accurate insertion. The heavy metal parts insure cool running. Official tests on both the 30- and 60-ampere sizes show that their temperatures run much below the limits specified by the Underwriters' Laboratories standard.

No tools of any kind are required to renew the ferrule type; while the knife blade type can be renewed by the use of a screwdriver or wrench.

Exceptionally rugged construction throughout insures extraordinarily long life. Consequently the "Union" saves more than any other renewable fuse.

Both of these types are for sale by all leading electrical supply jobbers and dealers.

Our 96-page illustrated Catalogue No. 29 sent on request.

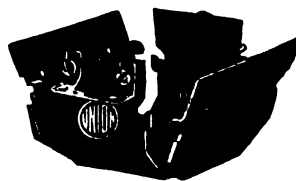


"UNION"
RENEWABLE
FUSE, KNIFE
BLADE TYPE

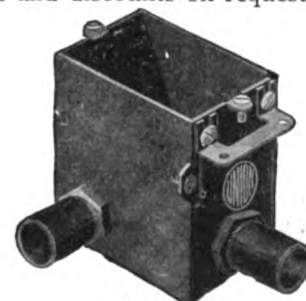
"Union" Sectional Switch Boxes

These boxes, with the exception of Nos. 155, 160 and 170, are equipped with reversible and sliding ears, suitable for either old or new work. All types are made from No. 14 U. S. gage steel and are accurately spaced to take standard push button switches and receptacles. All types are put together in an exceptionally rugged manner. The "GEM" boxes have both sides removable and can be built into gangs by simply removing the unnecessary sides and attaching the bodies together.

Complete details of construction, also information regarding clamps, solid gang tandem boxes, door switch boxes and bushings, may be found in Catalogue No. 29 which will be sent with prices and discounts on request.



GEM FC



GEM BD



GEM E



GEM X

A. F. DAUM

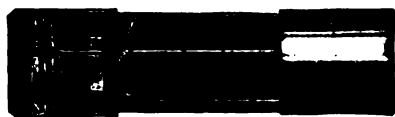
Sole Manufacturers of the Original Daum Refillable Electric Cartridge Fuse Shells
PITTSBURGH, PA.

Products

DAUM REFILLABLE and RENEWABLE CARTRIDGE FUSE SHELLS for electric light and power; FUSE STRIPS, PORCELAIN FUSE PLUGS.

Type "B" Refillable Fuses

The prices below govern all Type "B" Fuses.



NEW TYPE "B" REFILLABLE FUSE

This is a new refillable fuse and contains only six parts. Can be refilled in a few seconds. The metal part supporting the fuse strip is anchored in the fibre tube. With a few turns the cap is removed. Nothing to fall on the floor in refilling. Any standard fuse link can be used if desired.

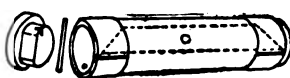
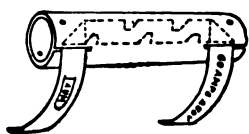
SIZES AND PRICES OF TYPE "B" FUSES

Volts	Catalogue No.	Amperes	Length over all, in.	Caps, in.	Tubes, in.	Number in package	List price
250	37	3	2	$\frac{9}{16}$	$\frac{1}{2}$	25	\$0.50
	36	6	2	$\frac{9}{16}$	$\frac{1}{2}$	25	.50
	38	8	2	$\frac{9}{16}$	$\frac{1}{2}$	25	.50
	39	10	2	$\frac{9}{16}$	$\frac{1}{2}$	25	.50
	40	15	2	$\frac{9}{16}$	$\frac{1}{2}$	25	.50
	41	20	2	$\frac{9}{16}$	$\frac{1}{2}$	25	.50
	42	25	2	$\frac{9}{16}$	$\frac{1}{2}$	25	.50
250	43	30	2	$\frac{9}{16}$	$\frac{1}{2}$	25	.50
	90	30	3	$\frac{13}{16}$	$\frac{3}{4}$	25	1.00
	91	35	3	$\frac{13}{16}$	$\frac{3}{4}$	25	1.00
	92	40	3	$\frac{13}{16}$	$\frac{3}{4}$	25	1.00
	93	45	3	$\frac{13}{16}$	$\frac{3}{4}$	25	1.00
	94	50	3	$\frac{13}{16}$	$\frac{3}{4}$	25	1.00
	96	60	3	$\frac{13}{16}$	$\frac{3}{4}$	25	1.00
600	162	6	5	$\frac{13}{16}$	$\frac{3}{4}$	10	1.10
	163	10	5	$\frac{13}{16}$	$\frac{3}{4}$	10	1.10
	164	15	5	$\frac{13}{16}$	$\frac{3}{4}$	10	1.10
	165	20	5	$\frac{13}{16}$	$\frac{3}{4}$	10	1.10
	166	25	5	$\frac{13}{16}$	$\frac{3}{4}$	10	1.10
	167	30	5	$\frac{13}{16}$	$\frac{3}{4}$	10	1.10
600	170	30	$5\frac{1}{2}$	$1\frac{1}{16}$	1	10	1.25
	171	35	$5\frac{1}{2}$	$1\frac{1}{16}$	1	10	1.25
	172	40	$5\frac{1}{2}$	$1\frac{1}{16}$	1	10	1.25
	173	45	$5\frac{1}{2}$	$1\frac{1}{16}$	1	10	1.25
	174	50	$5\frac{1}{2}$	$1\frac{1}{16}$	1	10	1.25
	176	60	$5\frac{1}{2}$	$1\frac{1}{16}$	1	10	1.25

Fuse Strips

A new system of fusing your lines has been developed saving 90% over any other way. It is absolutely foolproof.

You can make your own fuses complete as easily as you refill any



CONSTRUCTION DETAILS OF FUSE



FUSE STRIP IN ROLL
TESTED FUSE STRIPS FOR REFILLING. IN ROLLS

Amperes	Ft. per lb.	Renewals per lb.	Weight of roll, lbs.	Price per roll
6 to 30, not less than $1\frac{1}{4}$ -in. centers	145 to 90	400 to 240	$\frac{1}{4}$	\$2.00
35 to 60, not less than $2\frac{1}{2}$ -in. centers	172 to 112	700 to 368	$\frac{1}{2}$	2.00
65 to 600, not less than $3\frac{1}{2}$ -in. centers	55 to 4	145 to 7	1	2.50

Type "E" Renewable Fuse

A new blade fuse is here shown. It is the first absolutely foolproof fuse made. Only the proper fuse can be inserted and the end left exposed either for inspection or contact directly in the fuse clips, an entirely new departure in fuse structure. A poor contact impossible. The blown link can be removed and a new link inserted in a few seconds without a tool. One end is all that is removed in refilling. Contains only six parts.



TYPE "E" OR BLADE FUSE

SIZES AND PRICES OF TYPE "E" FUSES

Volts	Catalogue No.	Amperes	Length over all, in.	Blades, in.		Diam. tubes, in.	No. in pkg.	List price
				Wide	Thick			
250	101	65	$5\frac{1}{4}$	$\frac{3}{4}$	$\frac{1}{4}$	1	10	\$2.00
	103	75	$5\frac{1}{4}$	$\frac{3}{4}$	$\frac{1}{4}$	1	10	2.00
	105	85	$5\frac{1}{4}$	$\frac{3}{4}$	$\frac{1}{4}$	1	10	2.00
	107	100	$5\frac{1}{4}$	$\frac{3}{4}$	$\frac{1}{4}$	1	10	2.00
	110	105	$7\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	$1\frac{1}{2}$	5	4.00
250	112	125	$7\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	$1\frac{1}{2}$	5	4.00
	114	150	$7\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	$1\frac{1}{2}$	5	4.00
	115	175	$7\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	$1\frac{1}{2}$	5	4.00
	116	200	$7\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	$1\frac{1}{2}$	5	4.00
250	120	225	$8\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	2	2	7.50
	121	250	$8\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	2	2	7.50
	122	275	$8\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	2	2	7.50
	123	300	$8\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	2	2	7.50
	124	325	$8\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	2	2	7.50
	125	350	$8\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	2	2	7.50
	126	375	$8\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	2	2	7.50
	127	400	$8\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	2	2	7.50
	131	425	$10\frac{1}{4}$	2	$\frac{3}{4}$	$2\frac{1}{2}$	2	11.00
	133	475	$10\frac{1}{4}$	2	$\frac{3}{4}$	$2\frac{1}{2}$	2	11.00
250	135	500	$10\frac{1}{4}$	2	$\frac{3}{4}$	$2\frac{1}{2}$	2	11.00
	137	550	$10\frac{1}{4}$	2	$\frac{3}{4}$	$2\frac{1}{2}$	2	11.00
	138	600	$10\frac{1}{4}$	2	$\frac{3}{4}$	$2\frac{1}{2}$	2	11.00
600	180	65	$7\frac{1}{4}$	$\frac{3}{4}$	$\frac{1}{4}$	$1\frac{1}{4}$	5	3.00
	182	75	$7\frac{1}{4}$	$\frac{3}{4}$	$\frac{1}{4}$	$1\frac{1}{4}$	5	3.00
	184	85	$7\frac{1}{4}$	$\frac{3}{4}$	$\frac{1}{4}$	$1\frac{1}{4}$	5	3.00
	187	100	$7\frac{1}{4}$	$\frac{3}{4}$	$\frac{1}{4}$	$1\frac{1}{4}$	5	3.00
600	190	100	$9\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	$1\frac{1}{4}$	5	5.00
	191	125	$9\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	$1\frac{1}{4}$	5	5.00
	192	150	$9\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	$1\frac{1}{4}$	5	5.00
	193	175	$9\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	$1\frac{1}{4}$	5	5.00
	194	200	$9\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	$1\frac{1}{4}$	5	5.00
600	200	210	$11\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	$2\frac{1}{4}$	2	11.00
	201	225	$11\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	$2\frac{1}{4}$	2	11.00
	202	250	$11\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	$2\frac{1}{4}$	2	11.00
	203	275	$11\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	$2\frac{1}{4}$	2	11.00
	204	300	$11\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	$2\frac{1}{4}$	2	11.00
	205	325	$11\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	$2\frac{1}{4}$	2	11.00
	206	350	$11\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	$2\frac{1}{4}$	2	11.00
	207	375	$11\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	$2\frac{1}{4}$	2	11.00
	208	400	$11\frac{1}{4}$	$1\frac{1}{4}$	$\frac{3}{4}$	$2\frac{1}{4}$	2	11.00

All-porcelain Fuse Plugs

To refill, push strip in from bottom and through opening at top, pull down side and bend point in slot near bottom; then pull strip tight, push other end in plug and replace mica.

Same strip can be used in the plug fuse as is used in the cartridge fuse. Plug is permanent equipment.

Write for prices before ordering.



DAUM ALL-PORCELAIN FUSE PLUG

ECONOMY FUSE & MFG. CO.

Greenview Avenue at Diversey Parkway
CHICAGO, ILL.

ATLANTA, GA. BUFFALO, N. Y. DETROIT, MICH. LOS ANGELES, CAL. NEW YORK, N. Y. ST. LOUIS, MO.
BALTIMORE, MD. CINCINNATI, OHIO DENVER, COLO. MILWAUKEE, WIS. PHILADELPHIA, PA. SAN FRANCISCO, CAL.
BOSTON, MASS. CLEVELAND, OHIO KANSAS CITY, MO. MINNEAPOLIS, MINN. PITTSBURGH, PA. SEATTLE, WASH.

ECONOMY FUSE & MFG. CO. OF CANADA, LTD., MONTREAL, CANADA

Complete Stocks Carried by All Leading Electrical Jobbers and Dealers

Products

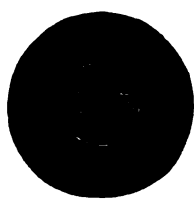
CLEARSITE NON-RENEWABLE PLUG FUSES; ECONOMY "APPROVED" RENEWABLE CARTRIDGE AND PLUG FUSES; "DROP OUT" RENEWAL LINKS; "ARKLESS" NON-RENEWABLE INDICATING FUSES.

Also manufacturers of Moulded Insulation, Screws for Electrical Work, and S.&C. High Potential Fuses (in Canada).

Clearsite Non-renewable Plug Fuses

"Clear Indication Always."

Clearsite fuses are the only non-renewable plug fuses using the famous Economy "Drop Out" link. This link, with amperage stamped upon it, is mounted with the operative section of the element directly under a window



CLEARSITE NON-RENEWABLE PLUG FUSE
Approved by Underwriters' Laboratories, Inc.

of unusual design. Clearsite fuses never fail to indicate. When blown on an overload a gap at the operative section is clearly visible; when blown on short circuit the window is blackened and vision of link is made impossible. Clearsite fuses, in capacities of from 3 to 30 amp. are sold in cartons of 500 and of 50, and in retail packages of 4 for 25¢.

Economy "Approved" Renewable Fuses

Economy fuses are made in three general types (ferrule, plug and knife blade) with a full line of capacity ranges for all commercial voltages. This was the first line of fuses approved in all capacities by the Underwriters' Laboratories, Inc., employing an inexpensive bare link for restoring a blown fuse to its original efficiency.

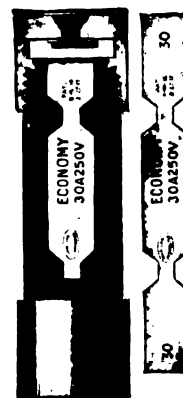
The fusible elements are of the "Drop Out" renewal link type, accurately rated and of definite design. Every part of an Economy fuse is built on the "safety first" principle, which means correct design from an electrical standpoint, and that the material entering into the construction of the fuse is the best that money can buy.

Improved Economy Renewable Fuse—Study the renewable link feature. See the two narrow bridges of metal holding the "Drop Out" features in place. In operations on short circuits, these two bridges fuse. The entire fuse metal does not volatilize, only the two narrow bridges. This very greatly decreases the danger factor due to the tremendous pressure gene-

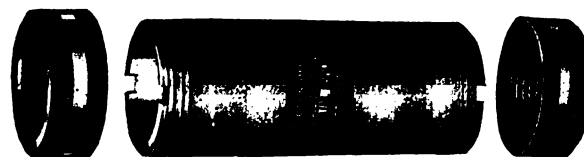
rated when an entire strip of fusible metal is instantly converted into gases. No powdered filler to deteriorate or solidify. Only the fuse metal is destroyed; the fuse itself is ready for years of service. See the new winged washer which makes it easy for anyone to replace the "Drop Out" renewal link in a few minutes.

Economy Fuse Savings—There is 80% of fuse maintenance cost saved yearly, as compared to cost of securing adequate protection by use of non-renewable "one-time" fuses.

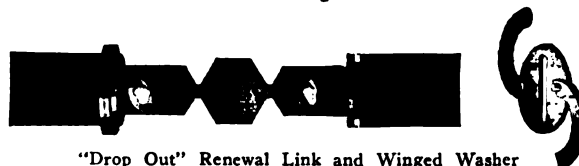
"Drop Out" Renewable Link—The heart of an Economy Fuse. Instantly restores a blown Economy fuse to its original efficiency at the absolute minimum of cost. A stock of "Drop Out" links, always on hand, represents a very small investment.



FERRULE TYPE
FUSE AND
"DROP OUT" RE-
NEWAL LINK



Cartridge



"Drop Out" Renewal Link and Winged Washer
ECONOMY KNIFE BLADE TYPE FUSE DISASSEMBLED

Economy Renewable Plug Fuses



PLUG TYPE FUSE AND "DROP OUT"
RENEWAL LINK

Use of the "Drop Out" renewal link in this plug type fuse results in similar operation and saving as in the Economy cartridge type fuses. No tools are required to replace the blown link and restore the plug to its original efficiency.

"Arkless" Non-renewable Indicating Fuses

Equipped with a positive mechanical indicator. Unexcelled for use on circuits not subject to frequent overloads.

Catalogue

Write nearest district office for Catalogue 17.



KNIFE BLADE
TYPE

GENERAL ELECTRIC COMPANY

GENERAL OFFICE
SCHENECTADY, N. Y.

D & W FUSE DIVISION
OF GENERAL ELECTRIC COMPANY
BRIDGEPORT, CONN.

D & W WIRE DIVISION
OF GENERAL ELECTRIC COMPANY
SCHENECTADY, N. Y.

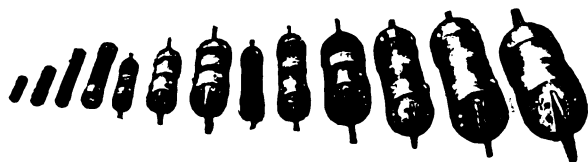
Products

D & W FUSES; FUSE ACCESSORIES; DELTABESTON ASBESTOS INSULATED WIRES; DELTA INSULATING TAPE AND SHEETING.

For General Electric Equipment, see pages 728-749.

D & W Fuses

The manufacturers of D & W fuses have incorporated the soundest engineering principles in the design of each individual fuse, and the closest attention is given to all details in manufacture. The result is a fuse that is accurate in operation and that protects equipment under the most exacting conditions. D & W fuses range in size from 1 to 1000 amperes for all standard voltages.



D & W FUSES ARRANGED FROM 3 TO 1000 AMPERES CAPACITY

Fuse Accessories

D & W fuse accessories include enclosed fuse cut-outs, cut-out bases, fuse boxes, fuse links and clips, service switches, telephone and telegraph protectors, etc. The same quality of workmanship and material enters into these devices as is found in D & W fuses and other products. Further information on this line is given in catalogue No. 15, mailed on request.

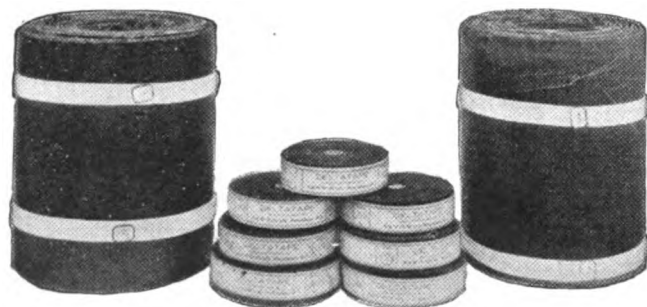


D & W WATER-PROOF SERVICE SWITCH BOX

Delta Insulating Materials

Deltatape is a high heat resisting material having asbestos fiber as a base. Its thinness and flexibility make it especially applicable on covers and terminals of coils and between turns of flat wound motor coils. It can be furnished in any thickness from 10 to 25 mils., widths ranging from $\frac{3}{4}$ to $1\frac{1}{2}$ in.

Delta sheeting is the same in properties,



DELTA INSULATING TAPE AND SHEETING



texture, and finish as Deltatape. Furnished in rolls of any convenient length, the standard width being 8 in.

Address inquiries to D & W Wire Division of General Electric Company, Schenectady, N. Y.

"Deltabeston" Wires

All Deltabeston wires are asbestos insulated. Hence any form of variety will give practically permanent service when subjected to heat. After the insulation has been applied to the wire, in all except two types, the asbestos is filled with a compound which renders the finished product vaporproof as well as heatproof. Experience has demonstrated that Deltabeston wire will withstand also many chemical fumes.

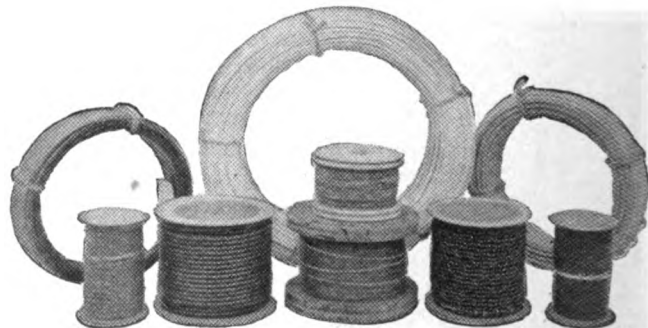
Deltabeston Magnet Wire—Used chiefly for winding coils in motors which run hot either because they are overloaded or because of their location with reference to external heat. The insulation consists of asbestos fiber applied to the wire in a felted form and then impregnated. This insulation is of approximately the same wall thickness as double cotton covered magnet wire. Deltabeston round magnet wire can be furnished round in sizes from No. 3 to No. 20, and rectangular and square in practically all sizes smaller than 5x25 in.

Deltabeston Fixture Wire or Heater Cord—Is flexible, extremely tough and resistant to abrasion, also heatproof and moistureproof. Heater cord with asbestos outer braid (Type A) is recommended for the exposed wiring of electric mining locomotives, for drop cords, etc.

Deltabeston Motion Picture Machine Cable—Used for wiring on cranes, controllers, and searchlights, as well as motion picture apparatus. Similar to heater cord, Type A.

Deltabeston Miscellaneous Wires—Serve a variety of purposes wherever heat is a factor in a wiring installation. Like the magnet wire, the insulation consists of felted asbestos, the only difference being in the wall thickness. The insulation is approximately $\frac{1}{2}$ in. thick.

This Company manufactures also stove wire, used chiefly for wiring electric stoves and ranges; switch-board wire, of practically the same construction.



DELTABESTON WIRES

EDISON LAMP WORKS

OF GENERAL ELECTRIC COMPANY

GENERAL SALES OFFICE

HARRISON, N. J.

DISTRICT SALES OFFICES

ATLANTA, GA.
BOSTON, MASS.CHICAGO, ILL.
CINCINNATI, OHIODENVER, COLO.
NEW YORK, N. Y.PHILADELPHIA, PA.
SAN FRANCISCO, CAL.

ST. LOUIS, MO.

DALLAS, TEX., SOUTHWEST GENERAL ELECTRIC CO.

For other Sales Offices see General Electric Company's Sales Offices on page 728.

Products

EDISON MAZDA LAMPS.
FOOT CANDLE METERS.

Lamps of Known Quality

For 42 years, the name Edison on an incandescent lamp has stood for quality. Each Mazda lamp is backed by that worldwide scientific service centered in the Research Laboratories of the General Electric Company—called Mazda Service—and the mark Edison MAZDA on an incandescent lamp is, therefore, truly the mark of the highest standard of quality.

Lamps for Every Lighting Demand—There is an Edison MAZDA lamp for every lighting demand—miniature MAZDA lamps for switchboards, flashlights, and automobile headlights; MAZDA B lamps in sizes from 10 to 60 watts for general lighting; MAZDA C lamps in sizes from 50 to 1000 watts for general, commercial and industrial lighting; special MAZDA lamps for locomotive headlights, motion picture projection, etc.

The diffusing bulb MAZDA lamps consisting of the 15-, 25- and 40-watt MAZDA B lamps and 50-watt White MAZDA lamps are specially designed for home lighting.

The 25- and 50-watt MAZDA mill type lamps find particular use where the lamp is subjected to severe vibrations and jars.

The Daylight MAZDA lamps in sizes from 75 to 500 watts are adaptable for use where approximate daylight is desired, such as in stores, show windows, printing plants, medical diagnosis, etc.

In order to prevent the glare from bare MAZDA C lamps in open reflectors, they may now be obtained with a coating of white enamel on the bowl of the lamp. These are known as Bowl Enameled MAZDA C lamps.

A new sign lamp, designated as the Blue MAZDA B sign lamp is now made with a special blue glass in order to give a whiter light than the ordinary clear bulb sign lamp.

Prices, Etc.—Price data and other information on any of these lamps may be obtained from the local Edison MAZDA lamp agents or from the most convenient district office noted above.

Large Stocks Carried at Many Points—Besides the stocks of lamps carried by all Edison MAZDA lamp agents, large stocks are carried in the following cities:

Boston, Mass.	Houston, Tex.	Philadelphia, Pa.
Butte, Mont.	Kansas City, Mo.	Pittsburgh, Pa.
Chicago, Ill.	Los Angeles, Cal.	Portland, Ore.
Cincinnati, Ohio	Minneapolis, Minn.	St. Louis, Mo.
Dallas, Tex.	New Orleans, La.	Salt Lake City,
Denver, Colo.	New York, N. Y.	Utah
El Paso, Tex.	Oklahoma City,	San Antonio, Tex.
Harrison, N. J.	Okla.	San Francisco, Cal.

It is thus possible to obtain immediate shipments of all types of standard incandescent lamps.

Foot Candle Meter

The Foot Candle Meter is a small, self-contained

instrument for reading lighting intensities. It is as simple and easy to read light intensities with this meter as it is to read temperatures with a thermometer.

Because of its compactness, it is very convenient to use and meets a longstanding demand for a small instrument sufficiently accurate to be of real practical value. A quick survey of any installation may be made with the Foot Candle Meter and definite information secured where increased intensities must be installed to obtain desired results.

Weight of meter.....3 lbs.
Size of meter.....8x6x1½ in.
Price.....\$25.00 net

Engineering Services Available

The Lighting Service Department, consisting of a corps of lighting experts, is maintained at the general sales office, Harrison, N. J. This department has had wide experience in all fields of illumination, and its purpose is to co-operate with all customers on questions relating to lighting. The results of their experience are available at all times on request. Lamp specialists will be found in district and local offices.

No charge is made for this service.

Bulletins

The following bulletins are published by the EDISON LAMP WORKS with the idea of conveying the information gathered by their engineers through investigation and research. They may be obtained on application to the Department of Publicity at Harrison, N. J.

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REFLECTOR & ILLUMINATING CO.

Manufacturers of Flood Lights

565 West Washington Street
CHICAGO, ILL.

Product

FLOOD LIGHTS for industrial purposes.

Model "B" Flood-O-Lite

The Model "B" Flood-O-Lite has been designed to meet the demand for a better flood lighting unit for industrial purposes. Its simplicity and rugged construction make it especially suitable for such uses.

Lamp (2)—The Flood-O-Lite is designed for ordinary 1300- to 1500-watt Type C lamps, obtainable anywhere. No special short-lived flood lighting lamps are required.

Reflector (7)—The reflector contained in this unit is 16 in. in diameter and has been designed for a beam spread of from $7\frac{1}{2}^{\circ}$ to 30° . It has a reflecting surface of pure silver plated on tough heat resisting glass, with a protecting coat of copper, and is guaranteed against peeling or discoloring for five years.

Housing (4, 8)—The housing is proof against insects, storm and water. It consists of a cast iron door frame and door, and heavy steel drum. The door is fitted with sectional polished wire glass, clamped between gaskets. The drum is rustproofed by a special process and finished with two coats of hard baked, black enamel. All moving parts, adjusting screws, etc., are made of brass as proof against corrosion and freezing.

Ventilation (5, 6)—Ample provision has been made for ventilation in order to insure full life of lamp and to prevent cracking of cover glass.

Adjustment (1, 3)—An improved adjusting mechanism provides for perfect control of the lamp in either plane and permits a rapid change of beam divergence of from $7\frac{1}{2}^{\circ}$ to 30° . By means of three adjusting screws any desired movement of the flood light may be effected.

Installation

Flood-O-Lite units may be mounted singly or in batteries.

Best results will be obtained by mounting them high out of the range of vision in order to prevent glare.

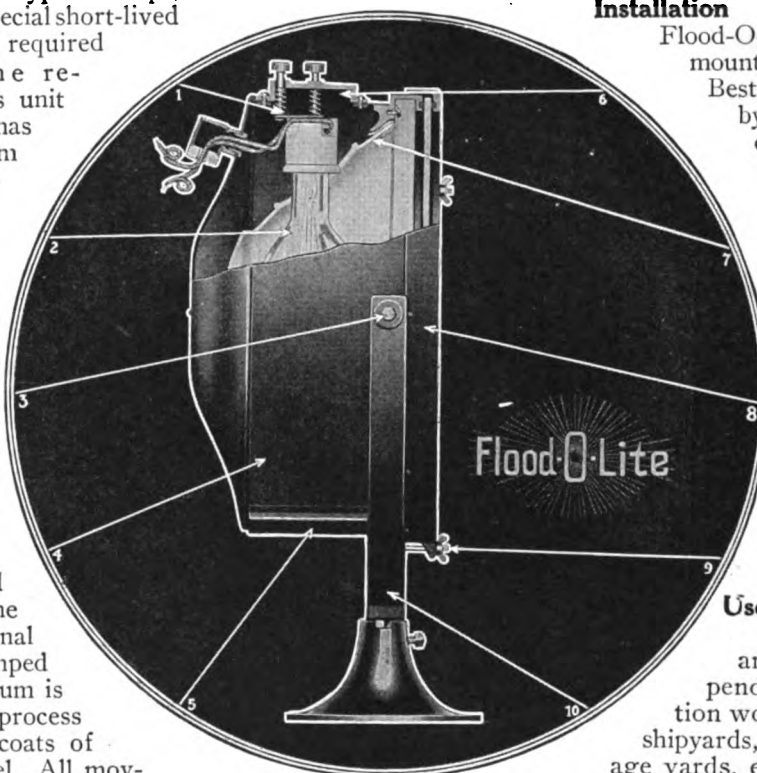
Three types of bases are provided: the pedestal base for mounting on a flat surface; brackets for mounting on walls or poles; and portable bases for use in construction work or similar installations.

Competent engineers will advise the best methods of installation without obligation.

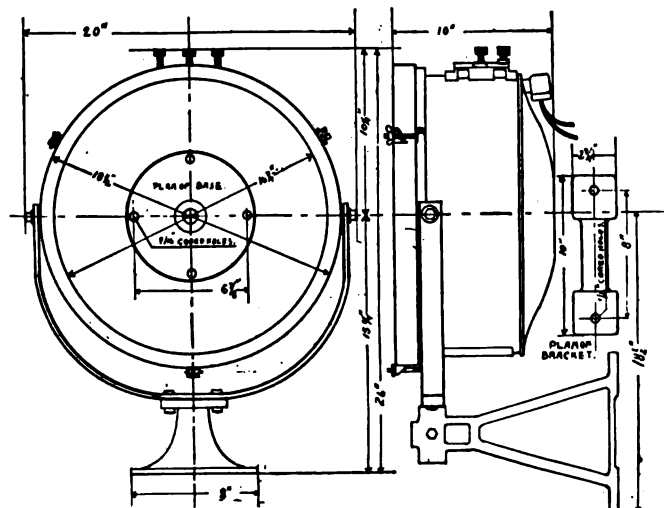
Uses of Flood-O-Lite Units

Flood-O-Lite units are very efficient and dependable for night construction work, night work in shops, shipyards, quarries, docks, storage yards, etc. Their use is also a protection against theft.

Flood-O-Lites are also used extensively for illumination of public buildings, monuments, signs and billboards.



EXPLODED VIEW OF
MODEL "B" FLOOD-O-LITE



With Pedestal Base With Bracket
MODEL "B" FLOOD-O-LITE

Prompt Shipment of Flood-O-Lite Units and Repair Parts

A large stock of Flood-O-Lite units and parts are carried available for immediate shipment. Write for Bulletin No. 10.

NO. 500 FLOOD-O-LITE WITH CLEAR GLASS COVER AND 500 WATT "C" LAMP

Distance to lamp, feet	$7\frac{1}{2}^{\circ}$			15°			$22\frac{1}{2}^{\circ}$			30°		
	Dia. ft.	Area, sq. ft.	Average foot candl's	Dia. ft.	Area, sq. ft.	Average foot candl's	Dia. ft.	Area, sq. ft.	Average foot candl's	Dia. ft.	Area, sq. ft.	Average foot candl's
25	3	7	240.	6	28	165.	9.5	70.	90.	13.6	143.	22.
75	9	63	26.	18	252.	18.	28.	616.	10.	40.6	1279.	2.5
150	18	252.	6.5	36	1011.	4.5	56.	2463.	2.5	81.	5116.	.6
250	30	702.	2.4	60	2808.	1.65	95.	7040.	.9	135.	14300.	.22
500	60	2808.	.6	120	11232.	.41	190.	28160.	.22			
750	90	6300.	.26	180	25270.	.18						
1000	120	11232.	.15									

IVANHOE-REGENT WORKS

OF GENERAL ELECTRIC COMPANY

Manufacturers of Ivanhoe Reflectors

5716 Euclid Avenue
CLEVELAND, OHIO

Products

Manufacturers of IVANHOE METAL REFLECTORS; IVANHOE GLASS-TOP REFLECTORS and FITTINGS for Industrial Plants.

Types of Reflectors

Based upon wide experience in industrial lighting, the Ivanhoe line has been redesigned—the manufacturer standardizing on four essential types with an addition of a few special service reflectors.

Each type, scientifically designed, is made to produce certain characteristic results which can be applied to any class of industry.

These different types are shown on the following pages and the characteristic distribution of light is shown for each.

Finishes of Reflectors

Ivanhoe reflectors are made of open hearth drawn steel with three standard finishes: porcelain enamel, aluminum, and paint enamel.

Porcelain Enamel—This finish is applied to the inside of the reflectors in three coats. The first is a binding coat, and it is covered by two coats of white porcelain enamel. The outside of the reflectors is treated with the same binding coat, and covered with one application of dark green porcelain enamel.

Aluminum—The aluminum finish is applied in five coats, three to the inside, and two to the outside. The final inside coat is transparent and washable, and the finishing coat on the outside is green paint. The metal form is thoroughly cleaned before the aluminum is applied, and the various coats are baked on separately. The finished reflector is well protected against rust; and although the reflecting surface does not collect dirt readily, it is easily cleaned by washing with a pure soap lather, or with a solution of four parts of warm water to one part ammonia.

Paint Enamel—The inside of the reflector is covered with a binding coat, and two coats of glossy white paint enamel. A glossy green paint enamel is applied to the outer surface, and baked on to insure a tough and durable finish. The color is permanent.

Holders

The Ivanhoe reflectors are made with three distinct types of extension to conform to different systems of wiring and installing. These are the B-heel extension, the extension equipped with the D holder, and the R extension.

B-heel Type—The B-heel is the name applied to the fitter at the top of one type of extension. It



B-HEEL TYPE



TRADE-MARK

provides a convenient and practical method of attaching the reflector to a separable holder.

The B-heel is $2\frac{1}{4}$ in. for medium base lamps and $3\frac{1}{4}$ in. for reflectors used with mogul base lamps. B-heels of $2\frac{1}{4}$ in. fit the standard form "O" holders or holders Nos. 902, 822, 824 or 884. B-heels of $3\frac{1}{4}$ in. fit holders Nos. 622, 672 or 705.

D Type—A second type of extension is furnished with a brass clip ring reinforced by the D clamp strap, or holder, for attaching directly to brass shell sockets.

R Type—The R extension gives its reflectors the name of "solid top." This extension contains a porcelain socket which is held in place by a lock nut at the top of the extension. The socket is designed to fit a $\frac{1}{2}$ -in. conduit. Besides providing for easy wiring, all R type reflectors are weatherproof.



D REFLECTOR ON SOCKET

To hang a D reflector on a socket, loosen screw, snap socket in ring, and tighten screw



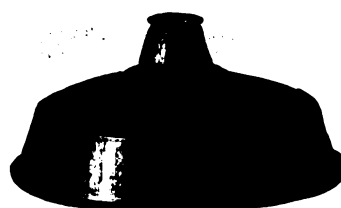
WIRING TYPE R REFLECTORS

Loosen lock nut at top of extension and raise reflector on pipe



METHOD OF WIRING HOLDER

Cover of holder raised on pipe in order to wire holder and clamp it to B-heel



STANDARD B-HEEL TYPE

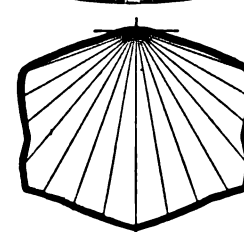
RLM Standard Dome Reflectors

For all sizes of Mazda C lamps. These reflectors are made in accordance with the specifications and design of the reflectors standardized by the Reflector and Lamp Manufacturers and therefore bear their standard designation RLM. They are recommended as the highest standard of the distributing type.

They are porcelain enameled, green outside and white inside.

For uniform illumination they should be spaced not to exceed one and two-thirds times their height above the work.

In ordering, the Ivanhoe number should be given.



CHARACTERISTIC DISTRIBUTION

D TYPE FOR ATTACHING TO
BRASS SHELL SOCKETSR TYPE WITH SOLID TOP CON-
TAINING PORCELAIN SOCKETSTANDARD B-HEEL TYPE, FOR USE WITH IVANHOE SEPARABLE
HOLDERS; D AND R TYPES, WITH HOLDERS ATTACHED*

Ivanhoe No.	Mazda C lamp, watts	RLM Standard designation	Dimensions, in.		Packing	
			Diam- eter	Depth	Number in standard package	Approx- imate shipping weight, lbs.
BEDD- 75	75	Dome-75	12½	5½	10	30
BEDD- 100	100, 150	Dome-100	14½	6½	10	35
BEDD- 200	200	Dome-200	16½	7½	5	25
BEDD- 500	300, 400, 500	Dome-500	18½	7½	5	25
BEDD-1000	750, 1000	Dome-1000	20½	10½	3	25
DEDD- 75	75	Dome-75 (for D type reflectors)	12½	5½	10	30
DEDD- 100	100, 150	Dome-100 (for D type reflectors)	14½	6½	10	35
DEDD- 200	200	Dome-200 (for D type reflectors)	16½	8½	5	25
REDD- 75	75	Dome-75 (for solid top reflectors)	12½	8½	10	55
REDD- 100	100, 150	Dome-100 (for solid top reflectors)	14½	9½	5	30
REDD- 200	200	Dome-200 (for solid top reflectors)	16½	10½	5	45
REDD- 500	300, 400, 500	Dome-500 (for solid top reflectors)	18½	12½	5	50

*Prices quoted on request.

Standard Bowl Reflectors

These reflectors for 25-, 40-, 50-, 60-, 75-, 100-, 150-, 200-, 500- and 1000- watt Mazda lamps replace the two Ivanhoe lines formerly listed as "Extensive Enamel" and "Intensive Enamel" porcelain enameled, green outside and white inside; their bowl shape furnishes an effective shield against the glare of the lamp. Spaced not to exceed one and two-thirds times their height above the working-plane.

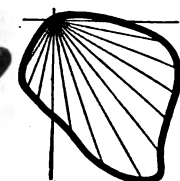
B-HEEL TYPE FOR
USE WITH IVAN-
HOE SEPARABLE
HOLDERSD TYPE FOR ATTACH-
ING TO BRASS SHELL
SOCKETSCHARACTER-
ISTIC DISTRI-
BUTIONSTANDARD BOWL REFLECTORS, B-HEEL TYPE, FOR USE WITH
IVANHOE SEPARABLE HOLDERS; AND D TYPE,
WITH HOLDERS ATTACHED*

Ivanhoe No.	Mazda lamp, watts	Dimensions, in.		Packing	
		Diameter	Depth	Number in standard package	Approximate shipping weight, lbs.
BEB- 60	25, 40, 50, 60	7½	5	10	15
BEB- 75	75	8½	6½	10	15
BEB- 100	100-150	8½	7	10	20
BEB- 200	200	10½	8½	10	25
BEB- 500	300, 400, 500	12½	8½	10	35
BEB-1000	750, 1000	15½	11½	10	55
DEB- 60	25, 40, 50, 60	7½	5½	10	15
DEB- 75	75	8½	6½	10	15
DEB- 100	100, 150	8½	7½	10	25
DEB- 200	200	10½	8½	10	25
REB- 60	25, 40, 50	7½	7½	20	40
REB- 100	100, 150	8½	9½	10	35
REB- 200	200	10½	11½	10	35
REB- 500	300, 500	12½	12½	5	30

*Prices quoted on request.

Porcelain Enameled Angle Type

These angle reflectors for 25-, 40-, 50-, 60-, 75-, 100-, 150-, 200-, 500- and 1000-watt Mazda lamps should be used in industrial plants where overhead lighting is impractical, requiring the outlets to be placed along the wall. The weatherproof, easy-wiring R type is especially adapted to billboard lighting.

B-HEEL TYPE ENAM-
ELED OR ALUMINUM
FINISH FOR USE WITH
IVANHOE SEPARABLE
HOLDERSD TYPE FOR ATTACH-
ING TO BRASS SHELL
SOCKETSR TYPE WITH SOLID
TOP CONTAINING POR-
CELAIN SOCKETCHARACTERISTIC
DISTRIBUTION

STANDARD ANGLE REFLECTORS*

Ivanhoe No.	Mazda lamp, watts	Dimensions, in.		Packing	
		Diameter	Depth	Number in standard package	Approximate shipping weight, lbs.
ALUMINUM B-HEEL TYPE, FOR USE WITH IVANHOE SEPARABLE HOLDERS; AND D TYPE, WITH HOLDERS ATTACHED					
BAL- 40	25, 40, 50	6½	5½	50	40
BAL- 60	60	8½	6½	40	40
BAL-100	75,100,150,200	10½	9	20	35
DAL- 40	25, 40, 50	6½	5½	50	40
DAL- 60	60	8½	7½	40	40
DAL-100	75,100,150,200	10½	9½	20	35
ENAMELED, B-HEEL TYPE, FOR USE WITH IVANHOE SEPARABLE HOLDERS					
BEL- 40	25, 40, 50	6½	5½	50	40
BEL- 60	60	8½	6½	30	35
BEL- 100	75, 100, 150, 200	10½	9	20	40
BEL- 500	300, 400, 500	12½	11½	5	30
BEL-1000	750, 1000	15½	15½	5	50
ENAMELED, D AND R TYPES, WITH HOLDERS ATTACHED					
DEL- 40	25, 40, 50	6½	5½	50	40
DEL- 60	60	8½	7½	30	35
DEL-100	75,100,150,200	10½	9½	20	40
REL- 60	25, 40, 50, 60	8½	9½	20	40
REL-100	75, 100, 150, 200	10½	11½	10	40
REL-500	300, 400, 500	12½	16	5	30

*Prices quoted on request.

Holders for Medium and Mogul Base Lamps and Reflectors

No. 822 is a porcelain socket holder, tapped at the top for ½-in. conduit. It is attached to the B-heel type by means of three clamps, which are locked into place by a ring.

No. 824 is No. 822 with top casting fitted to take a weatherproof green porcelain enameled canopy.

No. 884 is a green porcelain enameled setscrew holder containing porcelain socket.

No. 902 is a steel holder finished in green paint and can be used with any 2¼-in. B-heel reflector with either porcelain or composition socket.

No. 622 is a porcelain socket holder, tapped at the top for ½-in. conduit. It is attached to the B-heel by means of three clamps, which are locked into place by a ring.

No. 672 is No. 622 with top casting fitted to take a weatherproof green porcelain enameled canopy.

No. 705 is a green porcelain enameled setscrew holder containing porcelain socket.



622



672



705

HOLDERS FOR MUGUL BASE LAMPS AND REFLECTORS
3¼-in. fitters



902



822



824



884

HOLDERS FOR MEDIUM BASE LAMPS AND REFLECTORS
2¼-in. fitters

HOLDERS FOR MEDIUM AND MUGUL BASE LAMPS AND REFLECTORS*

Ivanhoe No.	Dimensions, in.		Packing	
	Diameter fitter	Length	Number in standard package	Approximate shipping weight, lbs.
622	3¼	5¼	10	30
672	3¼	6¼	10	40
705	3¼	5¼	10	25
822	2¼	2¼	10	10
822—With Pull-chain or Lock Socket	2¼	2¼	10	10
824	2¼	3¼	10	15
824—With Pull-chain or Lock Socket	2¼	3¼	10	15
884	2¼	3¼	10	10
902	2¼	3¼	50	..

Holders including sockets can be supplied with lamp-grip sockets, if so desired.

*Prices quoted on request.

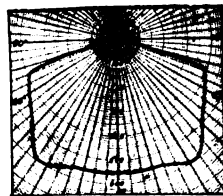
Ivanhoe Glass-top Reflectors—Dome Type

These reflectors are made only in the standard dome type, their contour conforming to that of the RLM standard dome reflectors. The metal part of the reflector is one compact piece, the form and the heel being connected by substantial legs rigidly welded.

A glass section of good quality opal glass of light density and excellent diffusing properties permits a portion of the light to be transmitted above the hanging height of the reflector. The glass section is firmly held in place by metal clips.



Fixture



Characteristic distribution,
BEDD-200—G.T.

IVANHOE GLASS-TOP REFLECTOR

IVANHOE GLASS-TOP DOME REFLECTORS, B-HEEL TYPE, FOR USE WITH IVANHOE SEPARABLE HOLDERS*

Ivanhoe No.	Mazda C lamp, watts	Dimensions, in.		Number in standard package	Approximate shipping weight, lbs.
		Diameter	Depth		
BEDD-75-G. T....	75	12¼	5¼	10	30
BEDD-100-G. T....	100	14¼	6¼	10	35
BEDD-200-G. T....	200	16¼	7¼	5	25

EXTRA TOPS FOR GLASS TOP REFLECTORS

Ivanhoe No.	Dimensions, in.	Number in standard package	Approximate shipping weight, lbs.
6062	Glass tops are of the same dimensions for all sizes of Glass-top Reflectors.....	40	50

*Prices quoted on request.

The light transmitted by the glass section is not large in comparison with that in other directions, but it is sufficient to serve the definite purpose of relieving the contrast between the areas below and above the plane of the lighting units as well as lighting any equipment, such as pulleys, belts, and shafting, mounted above the level of the reflectors.

Reflectors with Pull-chain and Lock Sockets

Ivanhoe R Type reflectors with solid tops, containing medium screw sockets, as well as standard Ivanhoe holders for medium base lamps, can be supplied with pull-chain or lock sockets.

The pull-chain sockets are furnished with 6 ft. of ventilator cord attached to the chain. They permit the control of individual units in a lighting system which is controlled by a single switch, and eliminate the necessity for any other cut-out device.

Lock sockets in reflectors or holders prevent the removal of lamps from sockets except by the use of the proper key. Two keys are supplied with each order of such reflectors or holders; additional keys will be furnished on order at prices quoted.

R TYPE REFLECTORS WITH SOLID TOPS CONTAINING PULL-CHAIN OR LOCK SOCKETS*

Ivanhoe No.	Recommended Mazda lamp, watts	Dimensions, in.		Packing	
		Diameter	Depth	Number in standard package	Approximate shipping weight, lbs.
RED - 60	40, 50, 60	12¼	7	10	45
REDD-75	75	12¼	8¼	10	50
(RLM Dome)					
REDD-100	100, 150	14¼	9¼	5	30
(RLM Dome)					
REDD-200	200	16¼	10¼	3	25
(RLM Dome)					
REB - 60	25, 40, 50, 60, 75	7¼	7¼	20	40
REB -100	100, 150	8¼	9¼	10	35
REB -200	200	10¼	11¼	10	35
REL - 60	25, 40, 50, 60	8¼	9¼	20	40
REL -100	75, 100, 150	10¼	11¼	10	40
REW - 75	75	14	5¼	5	20
REW -100	100, 150	16	5¼	5	25
REW -200	200	18	6¼	5	35

HOLDER WITH PULL-CHAIN OR LOCK SOCKET

Ivanhoe No.	For lamp with Medium Screw base	Fitter		Number in standard package	Approximate shipping weight, lbs.
		2¼	3¼		
822		2¼	3¼	10	10
824		2¼	3¼	10	15

Specify pull-chain or lock socket when ordering.

Additional keys for lock sockets come 10 in package; the list price is 7 cents per key.

*Prices quoted on request.

Ivanhoe-Regent Opal Lamp Caps

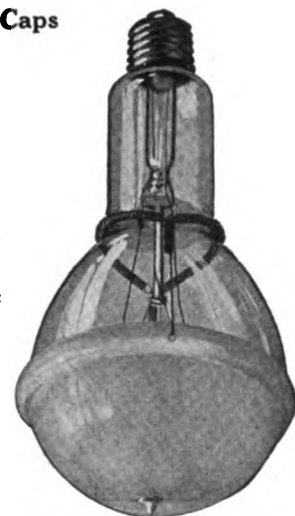
The Ivanhoe-Regent opal lamp cap is made of Genco glass, which combines splendid diffusion with low absorption. This cap improves the illumination by hiding the filament and cutting down glare. It is designed particularly for use with reflectors, both glass and steel, which do not give sufficient eye protection.

OPAL LAMP CAP*

Ivanhoe-Regent No.	For use with Mazda C lamps	Standard quantity dozen
GC-75	75	4
GC-100	100, 150	4
GC-200	200	4
GC-300	300	3
GC-500	400, 500	3

The prices include cap and spring as illustrated.

*Prices quoted on request.



OPAL LAMP CAP ATTACHED TO MAZDA C LAMP WITH SPRING WIRE HOLDER

CHESAPEAKE IRON WORKS

Traveling Cranes and Steel Structures; General Machine Work

BALTIMORE, MD.

Products

CHESAPEAKE CRANES: Electric Traveling, Grab Bucket, Wall, Jib, Pillar and Gantry.

STEEL STRUCTURES of all descriptions, including BRIDGES.

GENERAL MACHINE WORK.

ORNAMENTAL IRON WORK.

Chesapeake Electric Traveling Cranes

They are the most rugged cranes built, and are designed along the most approved lines of modern crane construction.

The trolleys are of the simplest possible construction, and all working parts are extremely heavy, thereby assuring maximum life under the most adverse operating conditions.

Due to the extreme simplicity of design, all parts are accessible for inspection and repair. Each unit can be removed without disturbing any other unit.

Trolley—The trolley incorporates, in every respect, those features which make for durability, and incorporates in the simplest manner these essential details:

A rigid "H" frame carries all mechanism, and does not rely on any part of the mechanism for rigidity.

All gears and shafts are extremely heavy. All bearings are bronze bushed.

Gear covers or guards protect all gears.



TRADE-MARK

Girders—The girders, of various types to suit span and other conditions, are of the most efficient design, to counteract the abuse of the most reckless operator.

The bridge drive is of the heavy type, having the driving motor located near the center of the span.

A platform, with angle toe guards and double bar hand rail, extends the entire length of the bridge drive girder.

"Safety First" Features—The "safety first" features include many details which are furnished regularly only on Chesapeake cranes.

Switchboard, mounted in steel cabinet with steel door and lock, includes a double pole main switch, contactor and independent overload relays for each direct current motor.

Limit switch, which prevents overhoisting, is operated by hook block in conjunction with no-voltage contactor on switchboard, with re-set push button in front of operator.

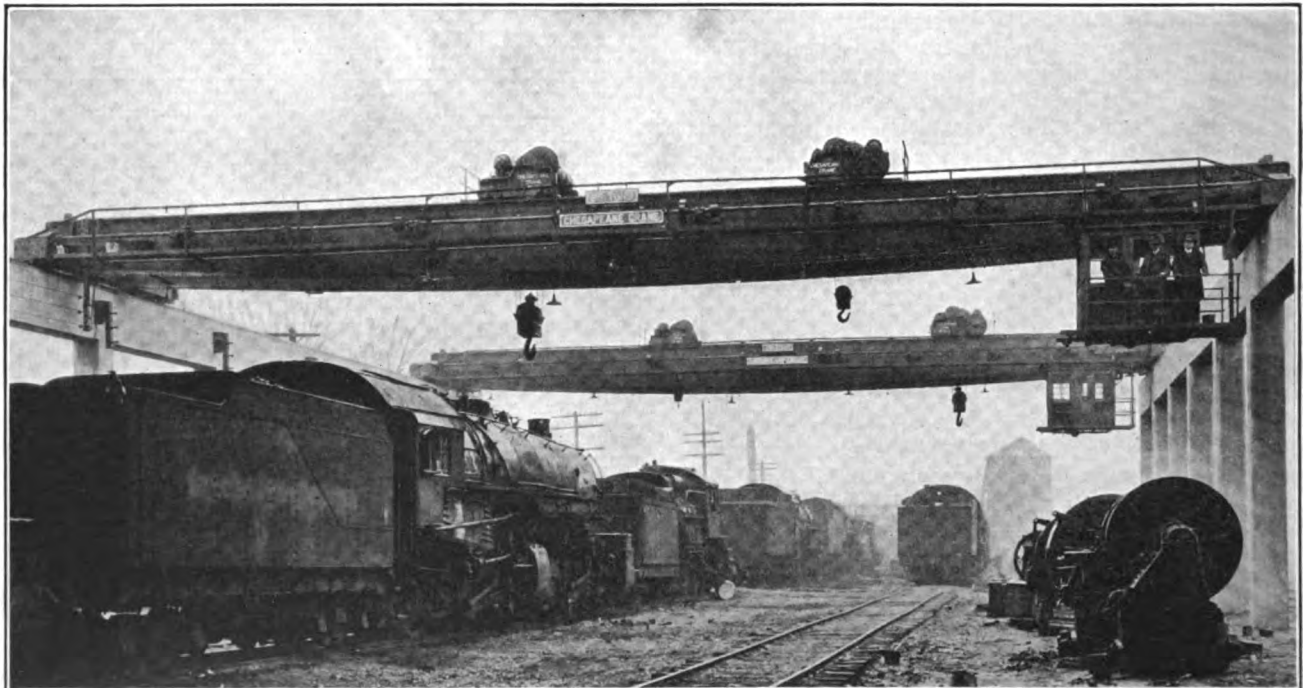
All gears are enclosed or suitably protected.

Bumper blocks on bridge ends.

Rail sweeps on bridge ends.

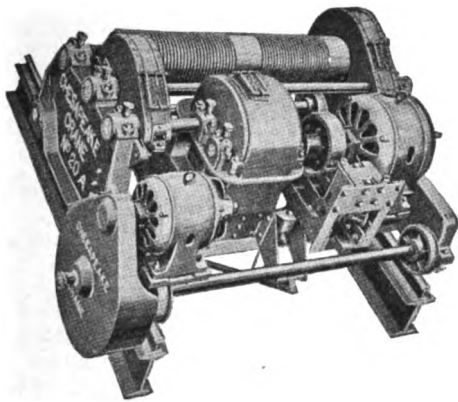
Extreme accessibility to all parts for inspection and removal for repairs.

Alternating Current Type Trolley—The alternating current type trolley is similar in every respect to



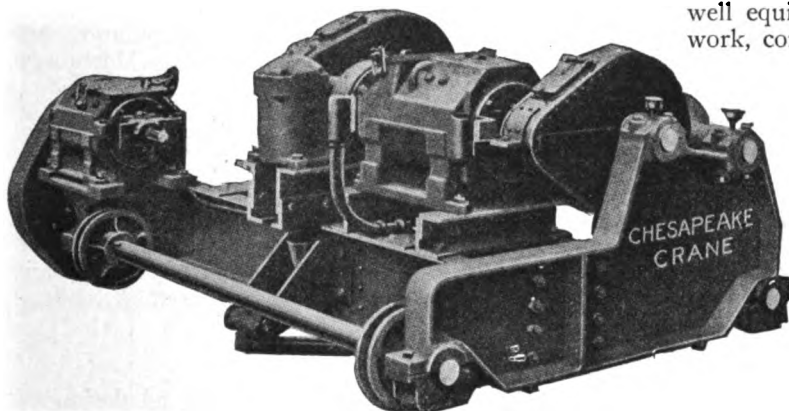
CHESAPEAKE ELECTRIC TRAVELING CRANES BUILT FOR THE BALTIMORE & OHIO R. R. CO., BALTIMORE, MD.
Both cranes are of 25-ton capacity, have span of 85 ft., and are equipped with 5-ton auxiliary trolleys

the direct current trolley, excepting that the hoisting mechanism is equipped with a mechanical load brake as described.



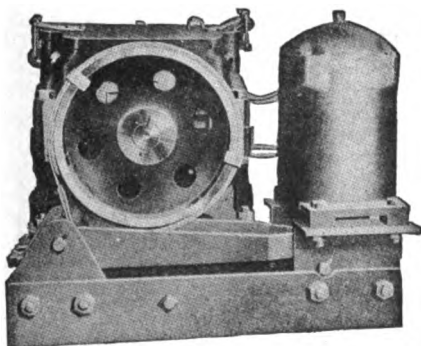
ALTERNATING CURRENT TYPE TROLLEY

Direct Current Type Trolley—Built to meet the most exacting requirements of heavy duty crane service, being extremely heavy in all details and most accessible in all parts. Lowering of load is controlled by a dynamic braking system and, in addition, a powerful electric brake is applied to the motor to hold load when current is off.



DIRECT CURRENT TYPE TROLLEY

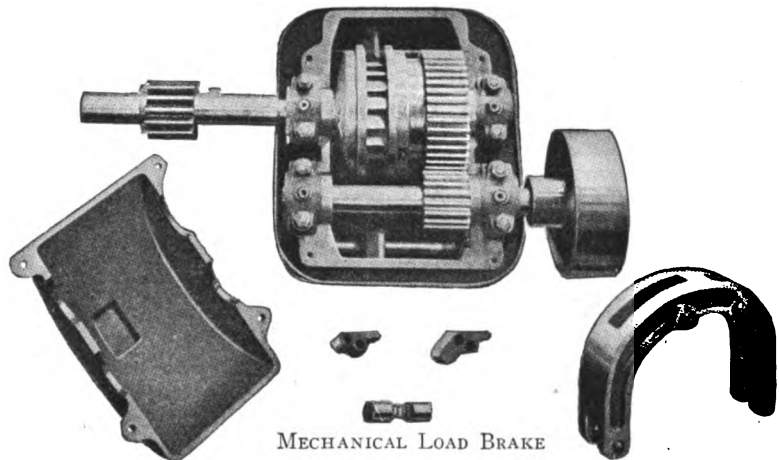
Electric Brake—The electric brake of the iron clad solenoid band type has holding power equally effective in either direction, in stopping empty hook when hoisting at high speed or in stopping and holding full load when lowering. Brake is always on when current is off and is entirely released when motor is running in either direction.



ELECTRIC BRAKE

Mechanical Load Brake—The Chesapeake load brake, which is of the multiple disk type, is positive

in its action, has ample capacity to sustain the full load, without the use of the electric brake, and will not allow



MECHANICAL LOAD BRAKE

the load to run down, except when operated by the hoist motor in the lowering direction.

The load brake, with its gears, is enclosed in an oilproof case, forming a complete self-contained unit. It is simple in design and extremely heavy in all details.

Ornamental Iron Work

The CHESAPEAKE IRON WORKS has a modern shop, well equipped for the manufacture of ornamental iron work, consisting of stairways, fire escapes, railings, etc.

Steel Structures

Specialists in the design, fabrication and erection of steel structures, including office, factory and shop buildings, highway bridges, etc. A large stock of Bethlehem and standard shapes is carried for immediate shipment.

Chesapeake Iron Works Doubles Capacity of its Structural Steel Plant

In the fall of 1920, the CHESAPEAKE IRON WORKS increased the capacity of its structural steel department 100%.



COAL HANDLING TOWER, BRIDGE AND AERIAL TOWER, WESTPORT POWERHOUSE, CONSOLIDATED GAS, ELECTRIC LIGHT AND POWER CO., BALTIMORE, MD.

Over 90% of all steel work in this power house was furnished by the CHESAPEAKE IRON WORKS.

General Machine Work

The CHESAPEAKE IRON WORKS, having a fully equipped and modern machine shop, is prepared to build special machinery and to do general machine work for outside companies, the material to be furnished either by them or the CHESAPEAKE IRON WORKS.

MANNING, MAXWELL & MOORE, INC.

SHAW CRANE WORKS

119 West 40th Street
NEW YORK, N. Y.

Products

ELECTRIC TRAVELING CRANES.

Also manufacturers of Electric Traveling Monorail Hoists.



the crane for the job in order to assure the maximum degree of satisfactory service, and further to suggest the element of insurance that underlies the purchase of a Shaw crane.

The Main Points

When you buy a crane, there are two factors to be considered: one, the design and construction of the crane itself, and the other and equally important, the application of the crane to specific requirements and conditions.

Every Shaw crane installation is with us an individual project, and, in fact, we are really engaged in an Engineering-Contracting business. We have an engineering service to offer which is backed by the accumulated experience of 30 years in the application of Shaw cranes to various industrial purposes.

The Application

As a case in point, consider the exacting requirements and responsibilities of foundry service. Handling and pouring hot metal requires a sturdy crane and the utmost assurance of reliability and safety; while handling cores and drawing patterns (heavy and light) requires a steady crane and accurate and dependable control.

In forge shop service, the crane must stand up successfully under the stress and shocks of the hammer or press, and the control of all motions must be steady, accurate and immediately responsive. It is indeed fascinating to watch the extreme facility with which red hot forgings are handled by a Shaw crane and the remarkable unison between the operator of the forging press and the man in the crane cage.

In locomotive shop service, the heaviest locomotives are lifted and lowered, and here again there is the big element of responsibility, as for example in the operation of "wheeling" a locomotive, when the engine must be lowered on to the boxes with extreme precision.

Many other applications might be cited, but these few references will serve to indicate that certain essential qualities must be embodied in the original conception of

Design and Construction

While this is an engineering catalogue, it is quite impracticable in the available space adequately to describe and illustrate the design and construction of Shaw cranes. This subject is thoroughly covered by our descriptive bulletins, which will be sent on request.

The Shaw Crane a Pioneer

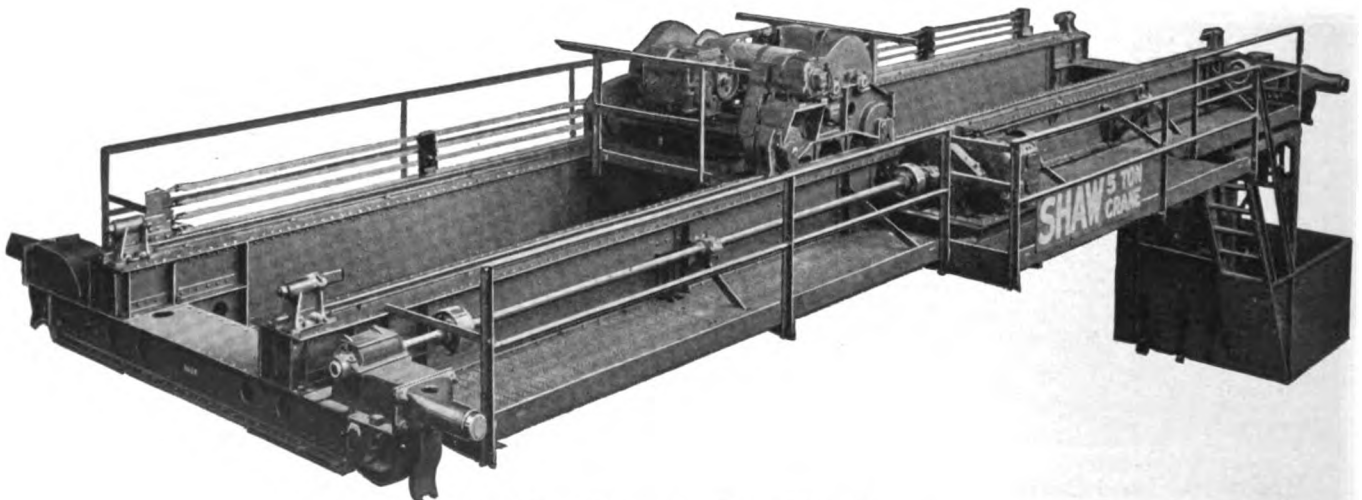
The Shaw Crane Works was established in 1890 and in fact Shaw built the first 3-motor electric traveling crane—with a separate motor and individual control for each motion. We want to make it clear, however, that while practically all of our early Shaw cranes (built 20 to 30 years ago) are still in regular service, we are not disposed to over-capitalize our age, and we want you to consider Shaw cranes on their present-day merits, on the merits of our service and on the reputation of MANNING, MAXWELL & MOORE, INC.—Machinery Headquarters.

Estimates and Preliminary Information

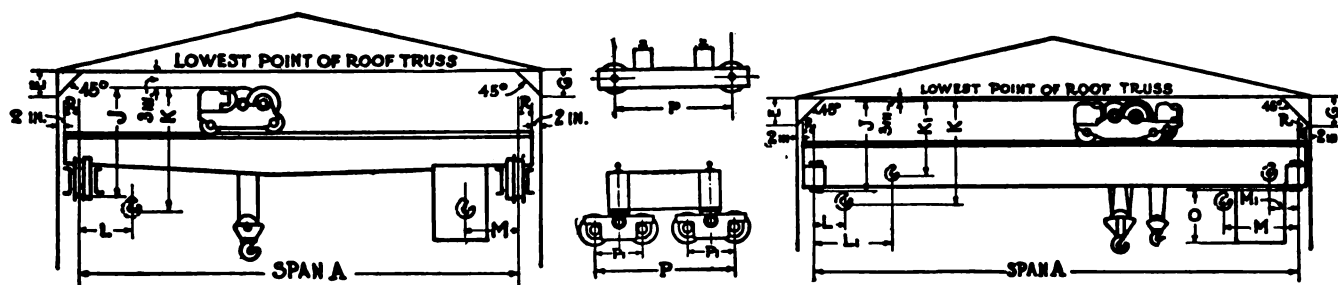
Bearing in mind that the requirements vary widely and that with us every crane is an individual project, please feel free to call on us at any time for preliminary cost estimates, clearance diagrams, or any other information we can supply. This sort of service we are keen to perform as good business and without any obligations on your part.

Clearance Dimensions

The succeeding page is devoted to a tabulation of clearance dimensions and wheel loads for various capacities and spans. This data is conservative and reliable, but for actual construction purposes, we would rather send you a layout more specifically applying to your individual requirements. The wheel loads are the maximum reaction per wheel with full load on the hook and with the trolley at the extreme end of the cross travel.



STANDARD SHAW CRANE FOR STEEL MILL SERVICE



DIMENSION DIAGRAM OF STANDARD 4-WHEEL SHAW CRANES

DIMENSION DIAGRAM OF STANDARD 8-WHEEL SHAW CRANES

DIMENSIONS OF STANDARD CRANES, 30-FT. HOIST

A ft.	R in.	J ft. in.	K ft. in.	L ft. in.	M ft. in.	P ft. in.	Runway rail A. S. C. E., lbs. per yd.	Maximum load on each wheel, lbs.
5-TON								
30	8	4 8	4 6	3 3	2 2	9 0	40	11000
40	8	5 2	4 6	3 3	2 6	10 0	40	13000
50	8	5 6	4 6	3 3	2 6	10 0	40	14600
60	8	5 6	4 6	3 3	2 6	10 10	40	16000
80	8	5 6	4 6	3 3	2 6	13 0	40	20000
10-TON								
40	8	5 6	5 0	3 7	2 7	11 0	40	20000
50	8	5 8	5 0	3 7	2 7	11 2	40	21000
60	8	5 8	5 0	3 7	2 7	11 4	40	22000
80	10	6 3	5 0	3 7	2 7	13 0	50	27000
100	10	6 3	5 0	3 7	2 7	16 0	50	34000
15-TON								
50	10	6 2	7 9	3 9	3 0	11 8	50	28000
60	10	6 2	7 9	3 9	3 0	11 10	50	30000
70	10	6 6	7 9	3 9	3 0	12 0	50	32000
80	10	6 6	7 9	3 9	3 0	13 0	50	34000
100	10	6 8	7 9	3 9	3 0	16 0	60	42000
20-TON								
50	10	6 8	7 9	3 9	3 6	12 2	60	35400
60	10	6 8	7 9	3 9	3 6	12 4	60	38000
70	10	7 0	7 9	3 9	3 6	12 6	60	40800
80	10	7 0	7 9	3 9	3 6	13 0	60	44000
100	12	7 6	7 9	3 9	3 6	16 0	70	54000

A ft.	R in.	J ft. in.	K ft. in.	L ft. in.	K ₁ ft. in.	L ₁ ft. in.	M ft. in.	M ₁ ft. in.	P ft. in.	P ₁ ft. in.	Runway rail A. S. C. E., lbs. per yard	Maximum load on each wheel, lbs.
30-TON, 5-TON AUXILIARY												
50	12	7 6	9 0	6 6	4 0	7 2	6 0	2 10	13 0	.....	70	52000
60	12	7 8	9 0	6 6	4 0	7 2	6 0	2 10	13 2	.....	70	55000
70	12	7 8	9 0	6 6	4 0	7 2	6 0	2 10	13 4	.....	70	58400
80	12	8 0	9 0	6 6	4 0	7 2	6 0	2 10	13 8	.....	80	62600
100	12	8 0	9 0	6 6	4 0	7 2	6 0	2 10	16 0	.....	80	74000
40-TON, 5-TON AUXILIARY												
50	12	8 0	10 4	7 0	4 6	8 0	6 8	3 2	13 0	.....	80	65000
60	12	8 3	10 4	7 0	4 6	8 0	6 8	3 2	13 2	.....	80	69000
70	12	8 3	10 4	7 0	4 6	8 0	6 8	3 2	13 6	.....	90	74000
80	12	8 8	10 4	7 0	4 6	8 0	6 8	3 2	13 6	.....	90	80000
100	12	9 4	10 4	7 0	4 6	8 0	6 8	3 2	16 0	.....	90	92000
50-TON, 10-TON AUXILIARY												
50	12	8 9	11 6	7 9	4 8	8 6	7 2	3 3	13 6	.....	90	80000
60	12	9 0	11 6	7 9	4 8	8 6	7 2	3 3	13 6	.....	90	84000
70	12	9 0	11 6	7 9	4 8	8 6	7 2	3 3	14 9	.....	90	89000
80	18	10 4	11 6	7 9	4 8	8 6	7 2	3 3	13 6	4 6	70	50000
100	18	11 0	11 6	7 9	4 8	8 6	7 2	3 3	14 6	4 8	70	58000
75-TON, 10-TON AUXILIARY												
50	18	10 10	12 6	8 6	4 6	9 0	7 6	3 0	13 6	4 6	70	56000
60	18	11 2	12 6	8 6	4 6	9 0	7 6	3 0	13 6	4 6	80	60000
70	18	11 6	12 6	8 6	4 6	9 0	7 6	3 0	13 6	4 6	80	66000
80	18	12 0	12 6	8 6	4 6	9 0	7 6	3 0	13 6	4 6	90	74000
100	18	12 9	12 6	8 6	4 6	9 0	7 6	3 0	15 0	5 0	90	80000
100-TON, 15-TON AUXILIARY												
60	18	11 4	12 9	9 0	4 6	9 0	7 6	3 0	13 6	4 6	90	76000
80	18	12 6	12 9	9 0	4 6	9 0	7 6	3 0	13 6	4 6	90	86000
100	18	13 0	12 9	9 0	4 6	9 0	7 6	3 0	15 0	5 0	100	96000
125-TON, 15-TON AUXILIARY												
60	18	12 0	13 8	10 6	4 9	9 9	8 6	3 6	13 6	4 6	100	92000
80	18	13 0	13 8	10 6	4 9	9 9	8 6	3 6	13 6	4 6	100	100000
100	18	14 0	13 8	10 6	4 9	9 9	8 6	3 6	15 0	5 0	110	112000
150-TON, 15-TON AUXILIARY												
60	20	12 6	13 8	10 6	4 9	9 9	8 6	3 6	13 6	4 6	100	106000
80	20	13 6	13 8	10 6	4 9	9 9	8 6	3 6	14 0	5 0	150	118000
100	20	16 0	13 8	10 6	5 0	10 0	9 0	4 0	16 0	5 0	150	134000

*These dimensions apply to 8-wheel cranes, and are the wheel-bases of the equalizing trucks.

NILES-BEMENT-POND COMPANY

Manufacturers of Electric Traveling Cranes, Machine Tools and Steam Hammers

111 Broadway
NEW YORK, N. Y.

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FOR CANADA: THE JOHN BERTRAM & SONS CO., LTD., Dundas, Toronto, Montreal, Winnipeg and Vancouver

Products

NILES ELECTRIC TRAVELING CRANES, TROLLEYS and HOISTS; GRAB BUCKET TROLLEYS and CRANES.

Also manufacturers of Hand Cranes, Gantry Cranes, Jib Cranes, Wall Cranes; Machine Tools and Steam Hammers.

Electric Traveling Cranes

The Niles cranes are built to operate continuously and approved safety devices are incorporated in their design. All parts are accessible for examination or removal, and delays for repairs are reduced to a minimum.

The cage is built of heavy angles and plates and thoroughly braced to eliminate vibration and distortion. It is connected with a platform extending entirely across the crane, affording easy access to the bridge motor, gears and bearings.

The controllers, located in the cage, give perfect regulation and are equipped with liberal wearing parts, ventilated contacts, carbon brushes, powerful magnetic blow-outs—all accessible from the front.

The mechanical load brake is of the double disk type, automatic in action and self-contained; it will not chatter under any condition of service and will not permit the load to run down unless the motor is revolved by power in the lowering direction. The electric brake is of the ironclad solenoid type—safe, powerful and accessible.

The Niles dynamic braking system can be supplied



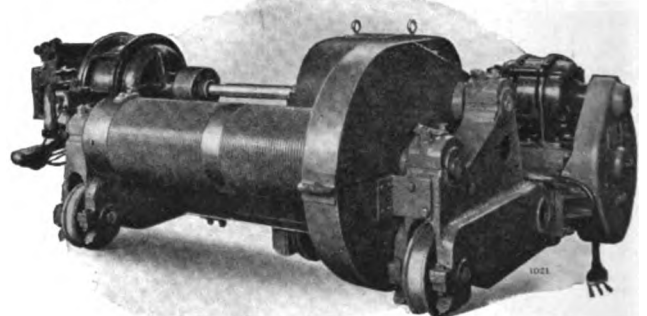
STANDARD CRANE
CONTROLLER
Face plate type

when desired, eliminating the mechanical load brake and at the same time insuring perfect regulation, safety and absolute control of the load.

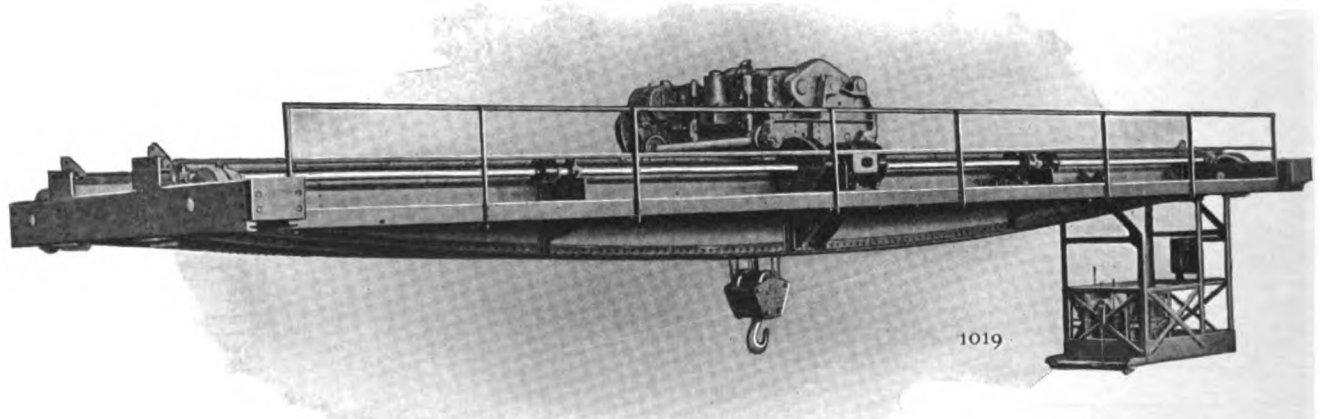
Bridge girders are made either of box section or I-beam with auxiliary braces, depending upon the capacity and the span. Both types have great lateral rigidity. Standard box section girders are built up of two web plates, four heavy angles and universal mill top and bottom cover plates. I-beam bridge girders are of heavy I-beam section with specially wide flanges with auxiliary brace composed of heavy channels and angles.

Standard Crane Trolley

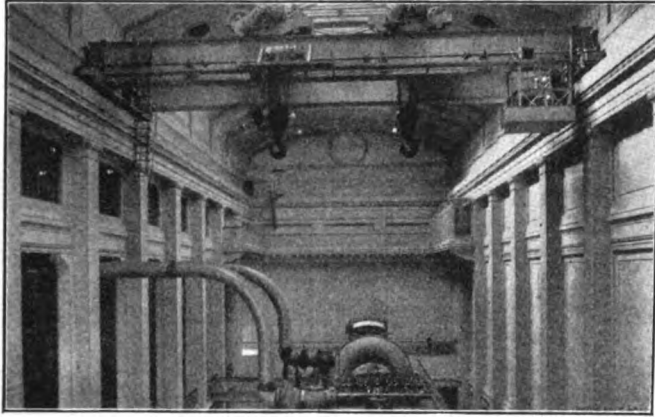
Framing consists of two double web sides connected by a built-up all-steel girt. Hoisting drum is finished all over and grooves cut right and left hand so as to always lift the load vertically, without twisting. All gears are enclosed in cast iron or welded steel cases, or carefully guarded.



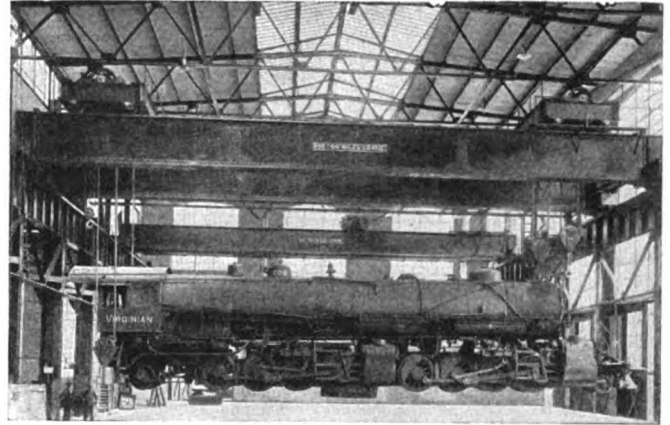
STANDARD CRANE TROLLEY
Without auxiliary hoist



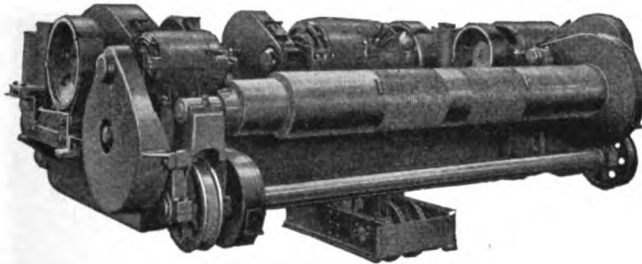
NILES ELECTRIC TRAVELING CRANE—STANDARD CONSTRUCTION THROUGHOUT



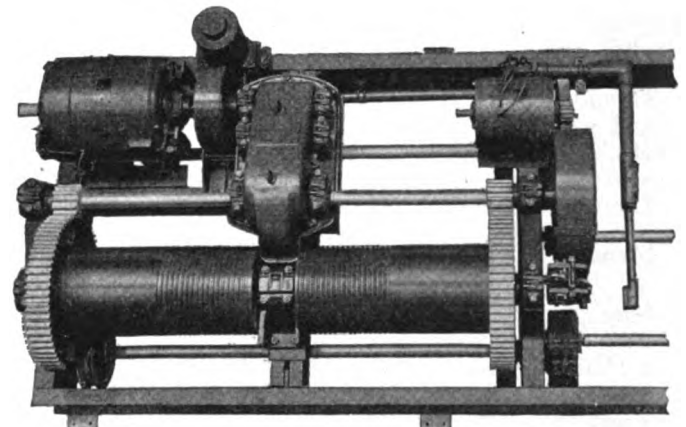
160-TON TRAVELING CRANE IN POWER PLANT OF PHILADELPHIA ELECTRIC CO.



200-TON LOCOMOTIVE LIFTING CRANE
75-ft. 6-in. span. Weight of suspended locomotive, 540,000 lbs., or 270 tons. Locomotive is hoisted between the girders, thereby obtaining maximum lift with minimum headroom



STANDARD CRANE TROLLEY
With independent auxiliary hoist



STANDARD GRAB BUCKET CRANE TROLLEY

Designed for operation with a two-rope grab bucket, one rope being attached to bail of bucket and the other to closing mechanism. The entire trolley frame forms a rigid self-contained construction on which the hoisting mechanism is mounted; automatic in action, no slack ropes

Directions for Inquiries

When sending inquiries for cranes, the class of service for which they are to be used should be stated: whether for machinshop, boilershop, foundry, stone-yard, power plant or whatever the case may be. If crane is for outdoor use, enclosed cage, if desired, should be mentioned. In addition to the above, we should have the following data, in order to properly make up a quotation:

(a) Capacity of crane in tons of 2000 lbs. (b) Span from center to center of runway rails. (c) Either the distance from top of runway rails to ground, or the maximum lift desired. (d) Distance from top of runway rails to lowest point of roof truss or other obstruction. (e) Distance from center of runway

rails to side walls of building. (f) Capacity of auxiliary hoist, if one is required. (g) Voltage and type of current. (If alternating current is to be used, advise number of cycles and the phase.) (h, i, j, k) If building contains wind braces. (l) Size of runway rail.

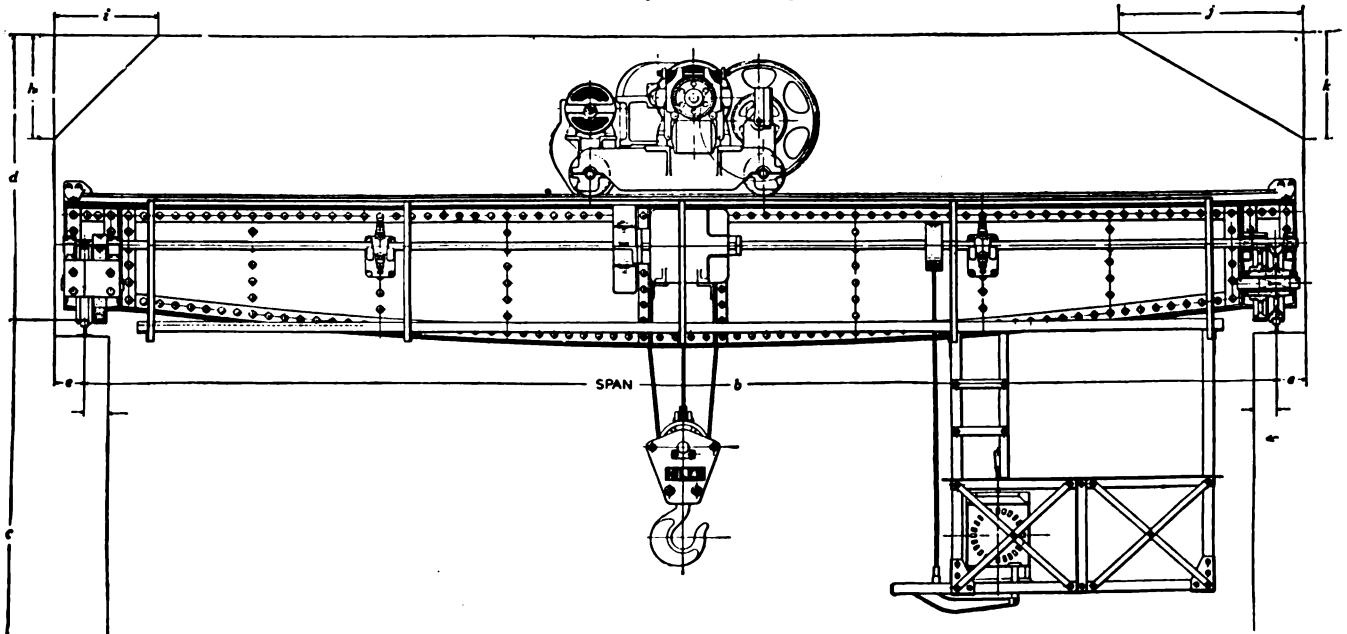


DIAGRAM NILES ELECTRIC TRAVELING CRANE

PAWLING & HARNISCHFEGER CO.

Manufacturers of Traveling and Portable Cranes, Hoists, Monorail Systems, Excavators, Portable Shovels and Machine Tools

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SEATTLE, WASH., L. C. Smith Building
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LOS ANGELES, CAL., Central Building

Products

STANDARD TRAVELING CRANES; BUCKET CRANES; HOIST and MONORAIL SYSTEMS (standard and special); CONTRACTORS' HOISTS and DERRICKS; PORTABLE GASOLINE CRANES; GAS SHOVELS; SKIMMER SCOOP EXCAVATORS; WHEEL TYPE TRENCH EXCAVATORS; LADDER TYPE TRENCH EXCAVATORS; POWER TRACTION BACK-FILLERS; POWER TRACTION TAMPERS; HORIZONTAL DRILLING, BORING and MILLING MACHINES.

Also manufacturers of Gantry Cranes; Lumber Handling Cranes, Hoists and Transfer Cars (standard and special); Dragline Excavators; Single Line Grab Buckets; Electric Hoists and Derricks of standard and special types; Centering Machines; Radial Wall Drills; Drilling and Boring Machine Accessories.

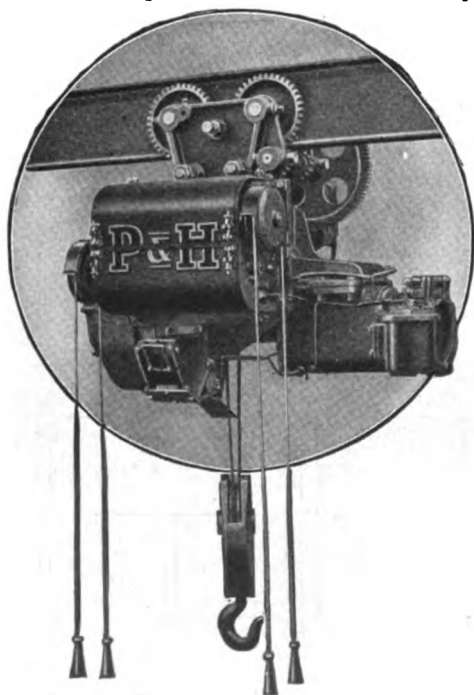
Standard Traveling Cranes

Over 7000 P & H electric traveling cranes have been put in service since the establishment of this company in 1884. They are built for every material handling service; for every type of industrial plant, shipyard, railroad shop or yard, mine, quarry, etc.

They are made for operation by direct or alternating current motors in varying spans and capacities.

Hoists and Monorail Installations

For moderate speed standard service the type "U"



P & H 2-MOTOR HOIST ARRANGED FOR FLOOR CONTROL

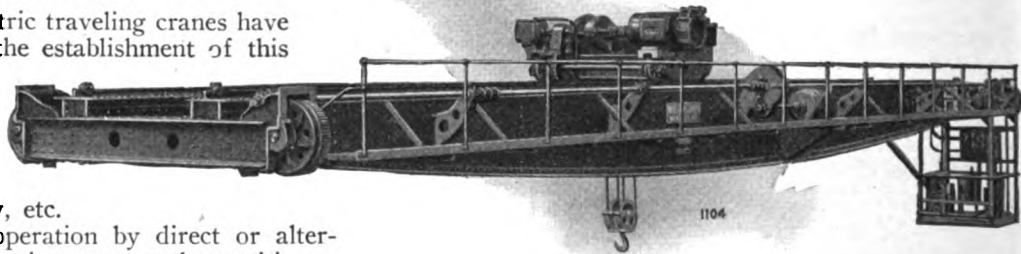
hoist built in capacities of from 1/2 to 6 tons can be applied in any industry.

For high speed heavy duty the type "O" hoist can be furnished in capacities up to 10 tons.

For the lumber industry the P & H double drum lumber hoist for handling units of from 2000 to 3000 b. ft. has been in successful use for 14 years.

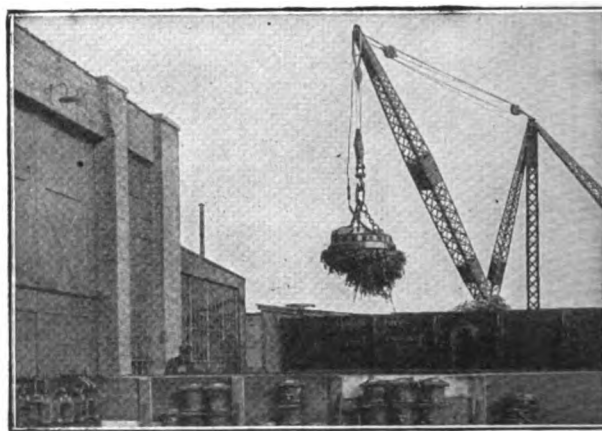
P & H Contractors' Hoists and Derricks

P & H hoists are designed for electric, gasoline or belt drive for use in all kinds of construction work, gravel pits, stone quarries, coal yards, industrial yards, on barges, derrick cars and for similar applications.



P & H TRAVELING CRANE, COMPLETE

The derricks are of all-steel construction of the standard stiff leg and guy types.



P & H HOIST AND DERRICK IN YARD SERVICE

Portable Gasoline Cranes

For industrial yard service work P & H gasoline corduroy cranes provide an economical, convenient material handling unit. They are started, stopped and handled as easily as a motor truck, and travel anywhere on their own corduroy traction.

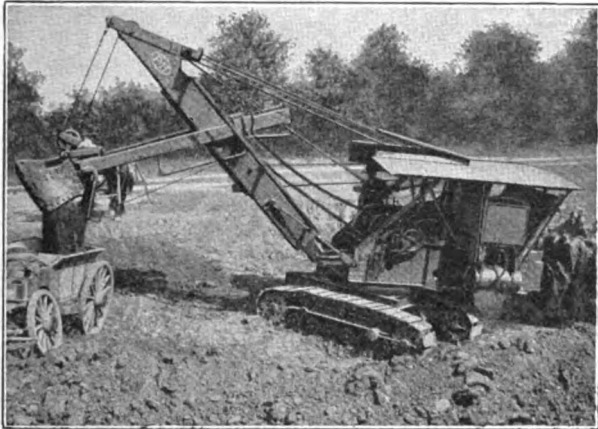
The No. 208 and No. 206 machines have full corduroy traction and the No. 205 half corduroy traction, the former being the larger machines.

P & H portable cranes are in successful operation all over the United States doing various classes of work.

They can be maneuvered around either side or end of freight cars, unload or load coal, pig iron, scrap, lumber, sand, gravel, ashes or other materials with grab bucket, sling chain or electro magnet.

P & H Gas Shovel

This machine is similar to the portable crane except that it has a shovel boom and dipper instead of the crane boom. It is operated similarly, has full circle swing,



P & H No. 206 CORDUROY TRACTION GAS SHOVEL

is one-man operated and has real crowding motion.

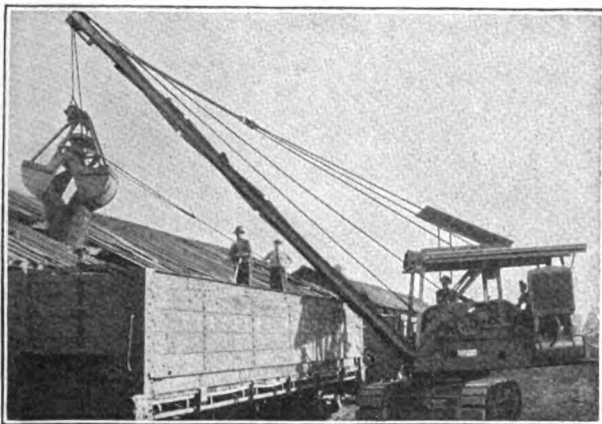
Built in $\frac{1}{2}$ -, $\frac{3}{4}$ -, 1- and $1\frac{1}{4}$ -yd. sizes.

P & H Skimmer Scoop

This same machine, described above, can be provided with a skimmer scoop for light road grading or stripping operations.

Portable Cranes for Handling Buckets and for Pile Driving

The P & H portable cranes described above may be equipped with standard booms to handle dragline.



P & H CRANE WITH CLAMSHELL BUCKET

clamshell or other digging buckets and may likewise be used with pile driving rig for pile driving operations.

Trenching Machinery

Trench Excavators—Made in two types: the wheel type for trenches up to $7\frac{1}{2}$ ft. and the ladder

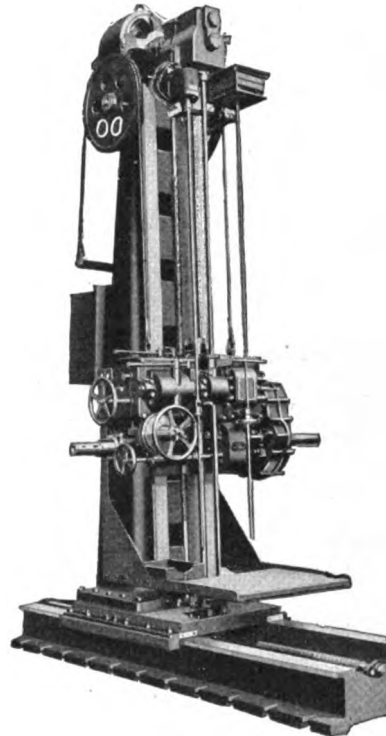
type for trenches up to 18 ft. in depth and various widths. These machines have replaced manual digging since speedier digging is possible at much lower cost.

Backfillers—Made in sizes to backfill from 150 cu. yds. to 400 cu. yds. per day. The dragline machine equipped with backfilling scraper can easily backfill 2000 cu. yds. of soil per 8-hour day.

Power Traction Tampers—Extensively used for tamping trenches, thus preventing trouble due to settling which occurs when trenches are hand tamped.

Horizontal Boring, Drilling and Milling Machines, Radial Wall Drills, Centering Machines

The P & H line embodies the latest development in

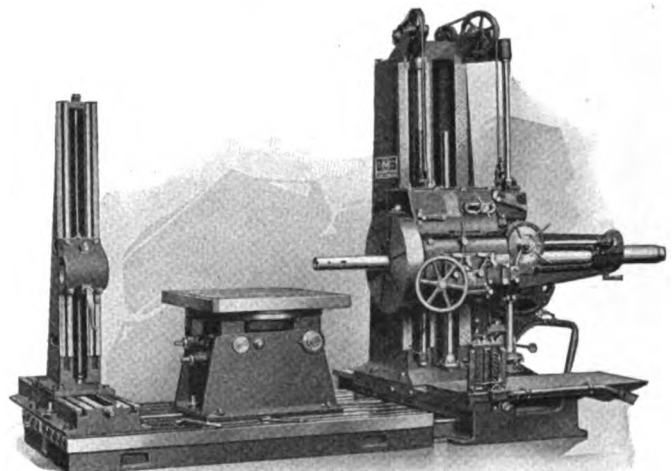


P & H No. 10 DRILLING AND BORING MACHINE

heavy duty machines, tools which will perform all classes of work.

These machines are in operation in some of the largest plants in the United States.

Write for details.



P & H 4-F MILLING, DRILLING AND BORING MACHINE

THE BARBER-FOSTER ENGINEERING CO.

Manufacturers of Cranes and Hoists

5005 Euclid Avenue
CLEVELAND, OHIO

Products

ELECTRICAL TRAVELING CRANES, Wall, Jib and Gantry Types; MONORAIL HOISTS, BUCKET HOISTS and MONORAIL SYSTEMS.

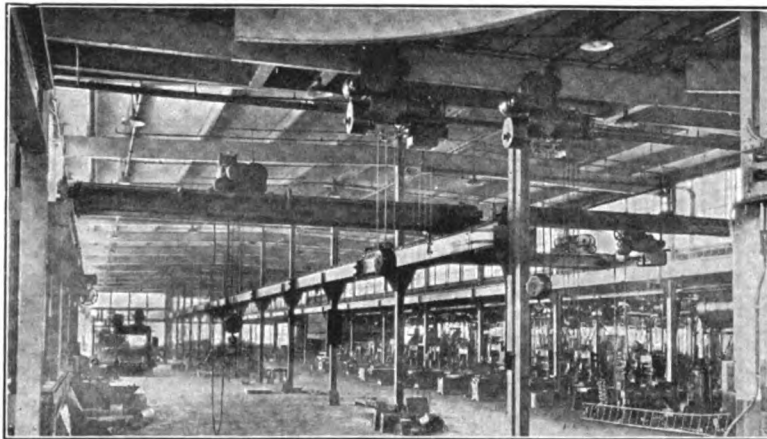
Also Special Hoisting Equipment designed to suit unusual requirements.

Built for Service

BARBER-FOSTER electric hoists and cranes are built for long and continuous service under the most severe operating conditions. Totally enclosed throughout, including gearing and mechanical brakes running in transmission grease. Iron clad electrical brakes. Enclosed motors of standard make, both alternating and direct current. Drum type, face plate or push button control. Gears and pinions throughout are cut from solid bar stock or forgings and are heat treated and hardened. All shafting heat treated, hardened and ground. Hyatt bearings throughout. Plow steel hoisting cable on all equipment.

CLEARANCE DIMENSIONS, STANDARD MONORAIL HOISTS

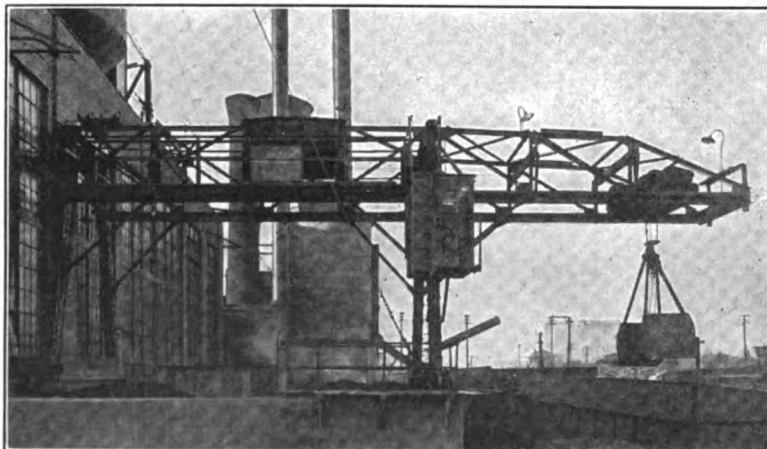
Frame No.	Capacity, tons	Hoisting speed, ft. per min.	Underside of beam to hook, minimum, in.	Length, in.	Width, in.	Wheel diameter, in.	Minimum I-beam, in.
1	$\frac{1}{2}$	35 18	31 32	36 $\frac{1}{2}$	19	5	7
2	$\frac{1}{2}$ 1 2	70 35 18	34 35 36	43 $\frac{1}{2}$	24 $\frac{1}{2}$	6	8
3	1 2 3 4	60 30 20 15	37 38 38 45	53 $\frac{1}{2}$	29 $\frac{1}{2}$	8	10
4	2 3 4 5 6	45 30 22 18 15	42 42 49 49 49	57 $\frac{1}{2}$	29 $\frac{1}{2}$	10	12



MONORAIL HOISTS AND TRAVELING CRANES

Two 7 $\frac{1}{2}$ -ton, 2-motor monorail hoists, two 5-ton, 2-motor traveling cranes, ten 2-ton, 2-motor traveling cranes. Equipped with Watson enclosed crane motors with Allen-Bradley type "F" control.

A typical utility installation in one of Cleveland's finest and most completely equipped plants



1 $\frac{1}{2}$ -yd., 4-motor BUCKET GANTRY CRANE

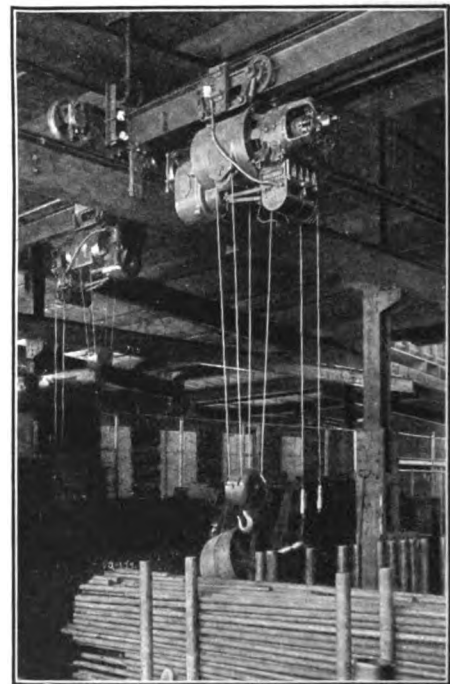
Equipped with Williams' 3-line bucket, Union drum type control, Ideal alternating current enclosed crane motors. Hyatt roller bearings used throughout.

The general design is adaptable to a wide variety of conditions, capacities and speeds to suit various requirements



2-MOTOR HOISTING TROLLEY USED ON 3-MOTOR TRAVELING CRANE

Three-motor cranes furnished in various spans and capacities from 2 to 15 tons with floor control or cab operation. For indoor or outdoor service. All parts scientifically designed, assuring greatest possible rigidity



SINGLE I-BEAM CRANE WITH FLOOR CONTROL

End trucks of semisteel or steel castings as may be required of I-beam section with U-shape ends, having a bearing on both sides of track wheel. Bearings fitted with Hyatt rollers with caps so that they are easily removable, and load is supported equally on the two bearings of each wheel

THE TOLEDO CRANE COMPANY

BUCYRUS, OHIO

Product

ELECTRIC TRAVELING CRANES.

Toledo Electric Traveling Cranes

Toledo cranes will be found in service in every branch of manufacturing industry.

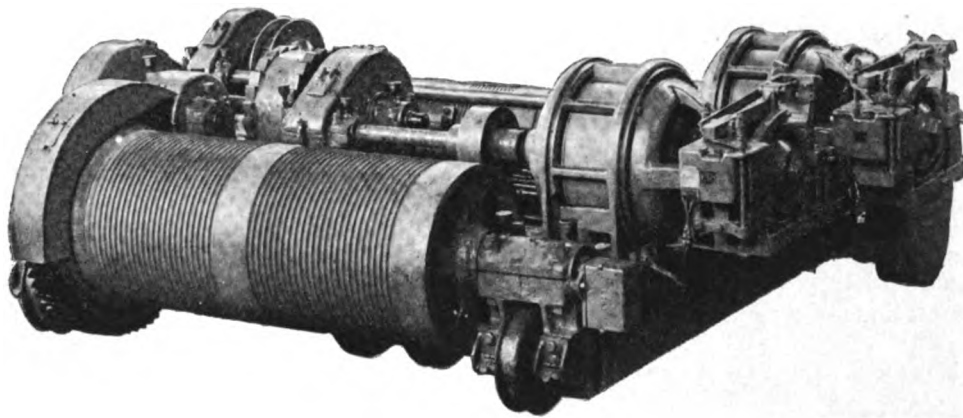
Through many years of service they have demonstrated that they are dependable, durable, efficient, economical, and have achieved recognition as important factors in reducing production and handling costs.

Toledo standards guarantee latest design, good engineering practice, accuracy, smoothness of operation, safety to operator and workmen, accessibility and ample safety factor.

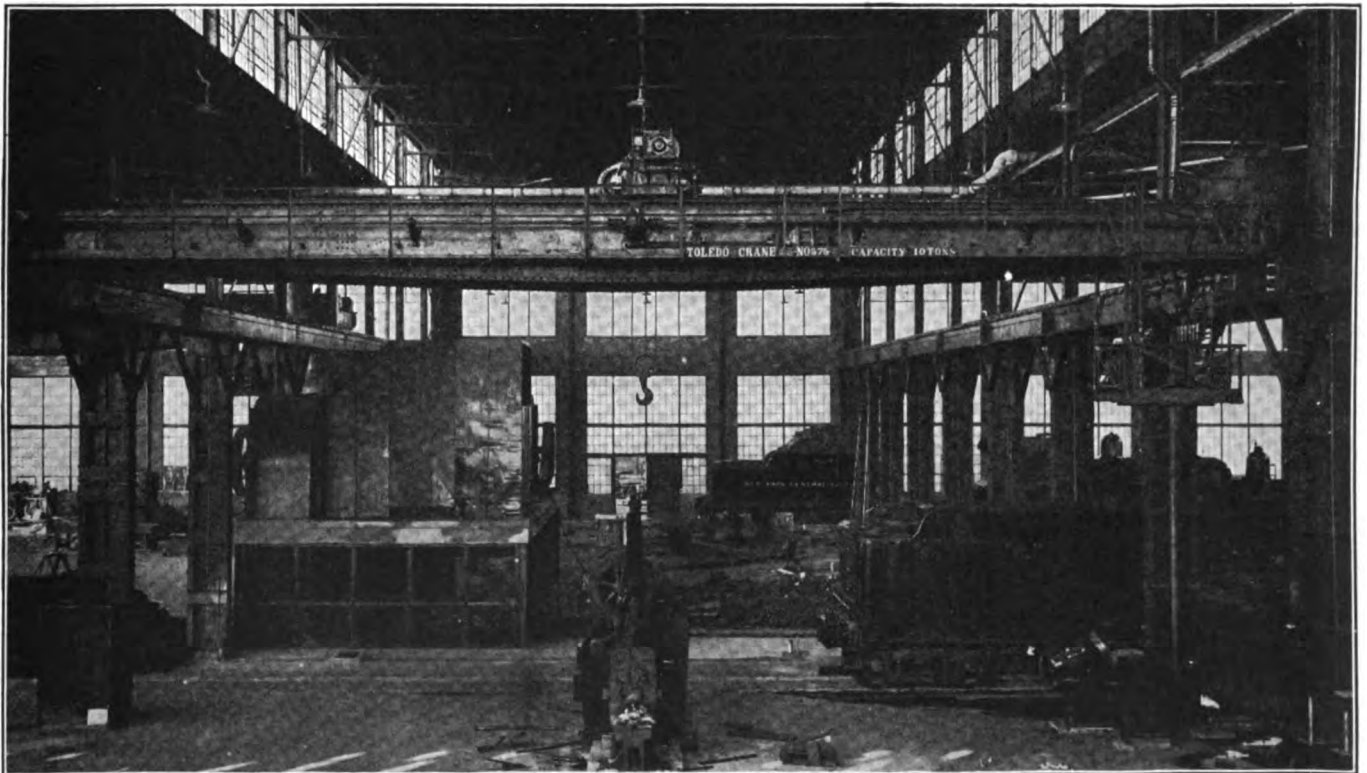
They are practical in design and precisely and staunchly built to assure years of satisfactory service.

Toledo cranes are built for capacities ranging from 5 to 400 tons.

Our engineers are at your command for counsel, plans or estimates.



STANDARD TROLLEY WITH AUXILIARY HOIST
Equipped with alternating current motors



TOLEDO ELECTRIC TRAVELING CRANE IN BOILER AND TANK SHOP OF THE MICHIGAN CENTRAL R. R., JACKSON, MICH.

WHITING CORPORATION

FORMERLY WHITING FOUNDRY EQUIPMENT CO.

Cranes of All Types

15611 Lathrop Avenue
HARVEY, ILL.

REPRESENTATIVES IN 25 PRINCIPAL CITIES

Products

CRANES for every service: Electric Traveling, Gantry, Hand Power Traveling, Jib, Pillar and Bracket.

For Foundry Equipment, see pages 878-879.

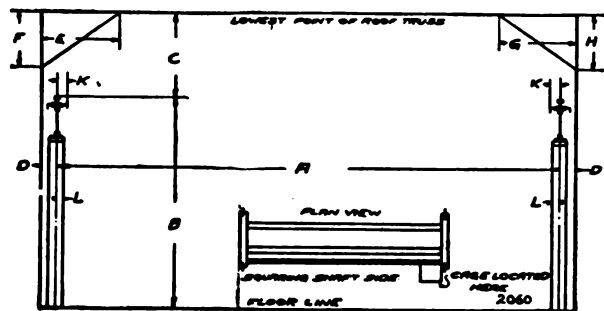
Electric Traveling Cranes

From 1- to 250-ton capacity and for every class of service, inside and outside. Designs based on over 35 years' engineering and manufacturing experience, and cranes can be depended on for safe, reliable operation. Built for practically any span, alternating or direct current; cage or floor control. Trolley may be arranged for handling clamshell bucket or lifting magnet.

Main Features—No overhanging gears. All gears on trolley run in oil in dustproof cases. All gears of steel, cut teeth. Bearings on trolley all bronze bushed. Through bolts used throughout. Wiring in iron conduit. Dependable electric and mechanical brakes. Positive limit switch prevents overtravel of hook. Footwalk with hand rail full length of bridge. All wearing parts readily accessible. Substantial rigid construction throughout.

Data for Quotations—In requesting prices please give:

(1) Capacity in net tons. (2) Class of service and whether inside or outside. (3) Kind of electric current available. (4) Clearance dimensions (refer to diagram below): (a) span, center to center runway rails; (b) lift, floor to rails; (c) overhead clearance; (d) end clearance; (e, f, g, and h), if there are any braces.



CLEARANCE DIAGRAM, ELECTRIC TRAVELING CRANE

Gantry Cranes

Numerous designs for varying capacities and spans.

Very useful for outdoor yard service.

Bucket-handling Cranes

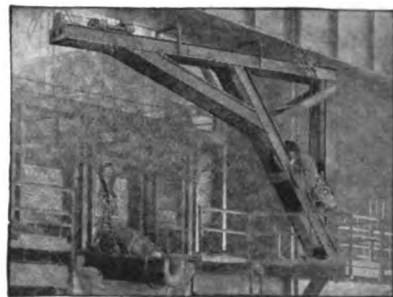
Both electric travelers and gantry cranes can be furnished with a bucket-handling trolley and used for handling coal, cinder, cement clinker or other loose material.



WHITING BUCKET-HANDLING GANTRY CRANE, UNION GAS & ELECTRIC CO., CINCINNATI, OHIO
138-ft. 9-in. span, 43-ft. 9-in. cantilever

Hand Power Traveling Cranes

Various types, 1- to 40-ton capacity, single or double I-beam bridges. Our standard rope drum trolley has two speeds and automatic brake. All movements operated by pendant hand chains from floor.



ELECTRIC JIB CRANE IN STEEL FOUNDRY

Jib Cranes

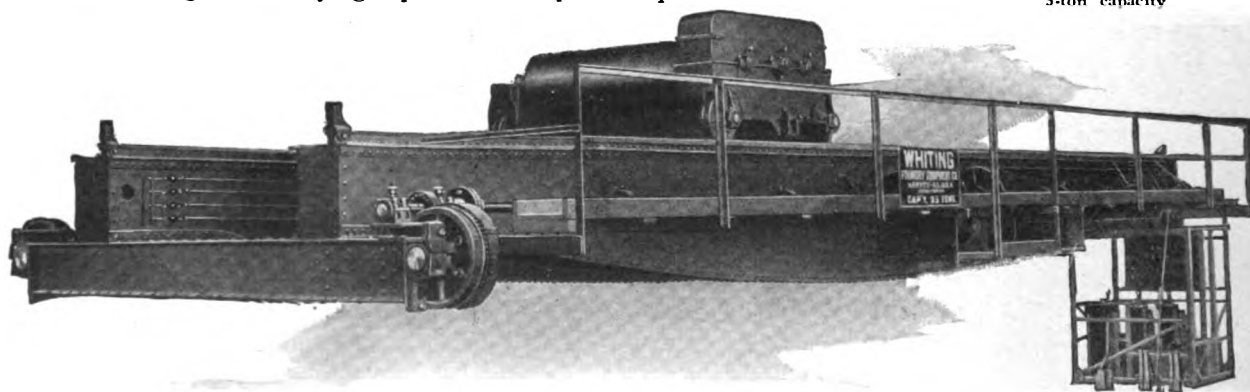
Various types: hand power, pneumatic and electric, both stationary and portable. In requesting price state capacity, height of lift, and radius desired. If electric, specify current.

Pillar Cranes

Various designs for inside or outside service, electric, pneumatic, or hand power. Swing complete circle. No overhead support required.



HAND POWER PILLAR CRANE
5-ton capacity



STANDARD 3-MOTOR ELECTRIC TRAVELING CRANE, BOX GIRDERS, M. C. B. TYPE TRUCK ENDS

HYATT ROLLER BEARING CO.

INDUSTRIAL BEARINGS DIVISION

NEW YORK, N. Y.

MOTOR BEARINGS DIVISION, DETROIT, MICH.

PACIFIC COAST DIVISION, SAN FRANCISCO, CAL.

TRACTOR BEARINGS DIVISION, CHICAGO, ILL.

Product

HYATT ROLLER BEARINGS.

For Shaft Roller Bearings, see page 710.

Hyatt Roller Bearings for Cranes, Trolleys and Hoists

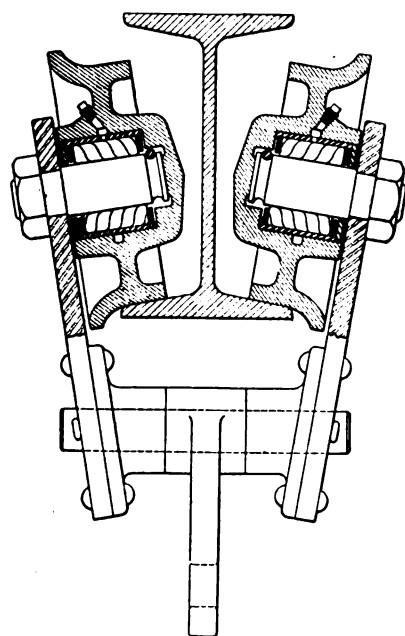
Into every modern system of material handling some forms of cranes, trolleys and hoists usually enter. A selection of the proper type of overhead transportation is important, and to insure economical handling it is equally important that the equipment be of the most modern design.

Hyatt roller bearings are essential parts of overhead handling equipment if real economy of power, lubricant and maintenance are to be secured. By reducing friction and thereby reducing the power required to operate, by operating for long periods of time without additional lubricant and by standing up under the severest service conditions for years without appreciable wear, Hyatt roller bearings make cranes, trolleys and hoists economical and dependable.

Many manufacturers of overhead handling equipment are prepared to furnish Hyatt roller bearings either as standard on their equipment or when specified.

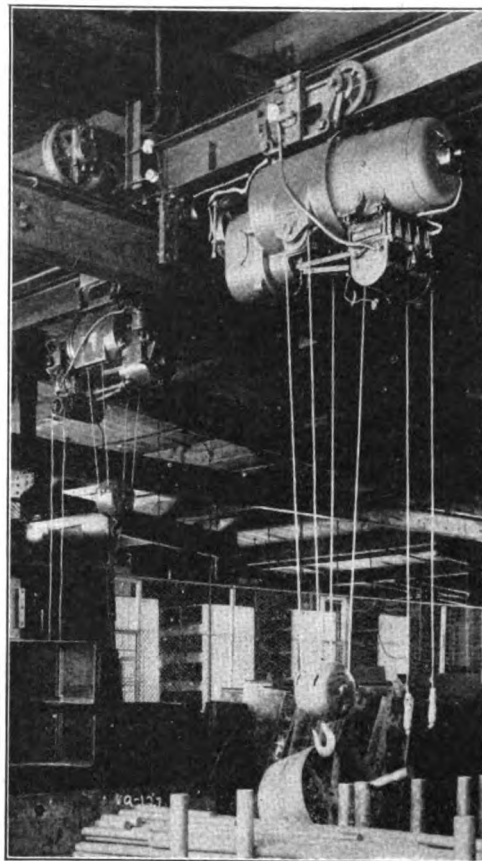
Advantages on Trolleys—One man can quickly handle the heaviest loads on a Hyatt equipped trolley without fatigue because the bearings begin to revolve just as soon as he exerts any effort.

A test shows that a pull of 95 lbs. was required to move a load of 4000 lbs. on a brass bearing trolley, where only 50 lbs. was required to move the same load on a Curtis-Hyatt equipped trolley. On comparing a Hyatt equipped trolley with a plain cast iron bearing trolley the ratio was 3 to 1 in favor of the Hyatt trolley.



TYPICAL HYATT EQUIPPED I-BEAM TROLLEY DESIGN

Hyatt roller bearings. A test of Hyatt equipped electric hoists showed that they require 22% less power to operate at a speed 21% greater than similar hoists with ordinary bearings. Thus a Hyatt equipped hoist is able to do the same work quicker and with less power with a smaller, lighter and less costly motor than a plain bearing hoist.



HYATT EQUIPPED ELECTRIC HOIST AND TROLLEY
MANUFACTURED BY BARBER-FOSTER ENGINEERING CO., CLEVELAND, OHIO

Cranes with Hyatt Bearings—Cranes in ordinary every-day use are subjected more than any other type of machinery to neglect and abuse. They are frequently overloaded and only in exceptional circumstances are they properly lubricated. Ordinary plain bearings will not stand up under such treatment for any length of time. A plain bearing crane is bound to be out of service more or less frequently for bearing repairs, often when it is most needed to speed up the work.

Because of their sturdy chrome-vanadium steel rollers, Hyatt roller bearings are capable of operating properly under the worst conditions of use and abuse, and therefore insure years of dependable crane service.

A recent test of two 10-ton bridge cranes, one equipped with plain bearings and the other with Hyatt roller bearings, showed a power saving during acceleration of 22.1% and an average saving in power required at normal traveling speed of 48.5% in favor of the Hyatt equipped crane.

Hyatt Engineering Service

Our engineers are bearing specialists and are often able to present designs for the use of Hyatt roller bearings that are of real value to manufacturers and users of cranes, trolleys and hoists. Get in touch with us regarding any bearing problem, without obligation.

DETROIT HOIST & MACHINE CO.

8195 Morrow Street
DETROIT, MICH.

Products

PNEUMATIC GEARED HOISTS; PNEUMATIC MOTORS; ELECTRIC HOISTS; MONORAIL HOISTS; TRAVELING CRANES.

Also manufacturers of Jib Cranes, Electric Trolleys, Electric Winches, Pneumatic Winches, Pneumatic and Electric Turntable Tractors.

Experience

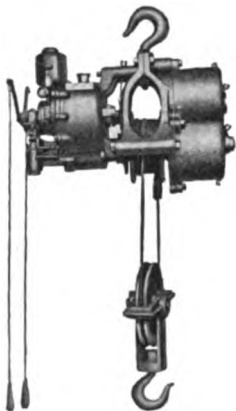
This Company is one of the pioneer manufacturers of small power driven hoists. "Detroit" hoists have been on the market for nearly twenty years, there being thousands in use throughout the world, rendering consistent service. These machines are unsurpassed in simple, accessible design, combined with durability, low initial cost and maintenance.

Geared Pneumatic Hoist

For handling loads with 80 to 100 lbs. air pressure, hoists are built in following capacities and hoisting speeds:

1/2-ton, 50 f. p. m.; 1-ton, 30 f. p. m.; 1 1/2-ton, 20 f. p. m.; 2-ton, 14 f. p. m.; 3-ton, 10 f. p. m.; 5-ton, 10 f. p. m.; 6-ton, 9 f. p. m.; 8-ton, 6 f. p. m.; 10-ton, 5 f. p. m.; 12 1/2-ton, 4 f. p. m. Height of lifts: 10 to 20 ft.; lifts up to 60 ft., however, are available.

Hoists are compactly designed, equipped with double oscillating, cylinder motor of simple design, connected through a train of spur gearing to hoisting drum and cable. All bearings running in oil.



TYPICAL 5-TON HOIST

Pneumatic Motors

Same general design as used in our pneumatic hoists, except arranged with feet or brackets to permit mounting for various applications. Motors are reversible, will operate with air or steam, and are built in following sizes:

2 1/4 h. p., 3 3/4 h. p., 5 1/4 h. p., 8 h. p., and 15 h. p. Speeds are: 300 r. p. m. to 600 r. p. m., depending on size.

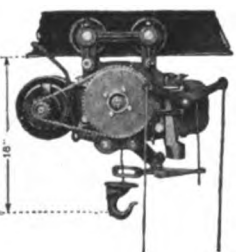
Motors have a wide field of application and can often be used where electric or other power is not feasible.



PNEUMATIC MOTOR

Electric Hoist

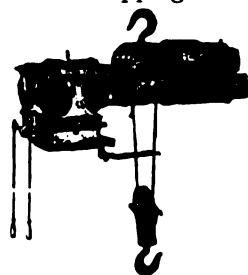
Type KS—This is an exceptionally compact and simple electric hoist, made in two capacities, 1/4-ton, 40 f. p. m.; 1/2-ton, 20 f. p. m.; height of lift: 15 ft. any standard current. Hoist is made in hook suspension, lug suspension or plain trolley (as here illustrated), takes extremely little headroom; weighs 250 lbs., yet is sturdy and constructed of best materials throughout. Frame is



1/2-TON KS HOIST
Mounted on I-beam trolley

solid steel casting. Motor is highest grade. Controller has oversized contacts. Machine cut, steel spur gearing is used. Bearings are best grade bronze. Cable is 1/8 in., wound on machine grooved drum, taking entire lift in grooves and arranged to prevent overlapping.

Type H—This hoist is built in several frame sizes, giving a range in capacities from 1/2 to 15 tons, and for any standard current. The mechanical features are essentially the same for alternating current or direct current. Hoist has high grade fully enclosed easily detached motor; compact drum type controller; best grade steel spur gearing running in oil bath; compact and reliable load brake running in oil; large machine grooved drum. All embodied most accessibly in a clean cut external design that is standing up in hundreds of installations under the most severe conditions. Hoist can be furnished in hook type suspension (as here shown) with plain or geared I-beam trolley, or electric trolley as shown below.

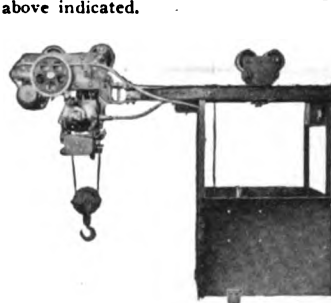


TYPICAL 2-TON SIZE
Hook type suspension

STANDARD SIZES, TYPE H HOISTS

Frame size	Capacity, tons	Speed of lift, f.p.m.	Standard height of lift, ft.	Distance between hooks, in.	Net weight hook type, lbs.
A	1/2, 1, 2, 3,	70, 35, 17, 11,	20, 20, 10, 10	34-40	550
B	2, 3, 4, 5, 6,	25, 17, 12 1/2, 10, 8 1/2	12	45-50	1150
D	3, 5, 7 1/2, 10, 15	36, 22, 14, 10 1/2, 7	12	55-64	1600

Hoists are also furnished for greater height of lift and speeds than above indicated.



MONORAIL HOIST, CAGE OPERATED



MONORAIL HOIST,
FLOOR OPERATED

Type H hoist mounted on electric trolley can be suited to various monorail requirements

TYPICAL 5-TON 3-MOTOR TRAVELING
CRANE

A complete line of medium weight cranes built from 1- to 10-ton capacity in spans up to 50 ft.



PNEUMATIC TURNTABLE
TRACTOR (ALSO BUILT
ELECTRIC)

These tractors are in daily service on over fifty railroads

Inquiries

Complete specifications and prices gladly furnished. Inquiries should always give capacity, kind of current available and purpose for which hoist is intended.

THE EUCLID CRANE & HOIST CO.

EUCLID, OHIO

Products

CRANES: Electric Traveling, Wall and Jib.

HOISTS: Electric and Hand Power Monorail and Double Track Trolley.

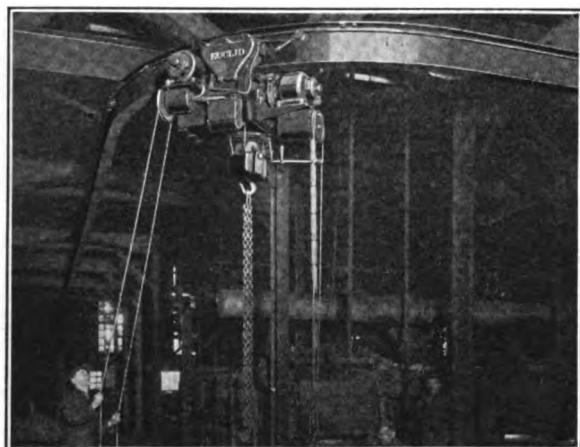
Design of Electric Cranes and Hoists

Euclid cranes and hoists are of exceptionally liberal design throughout for hard, continuous service. Wide face, coarse pitch gears and pinions all of steel with accurately cut teeth. Bronze bushed bearings of ample size. Oil bath lubrication and all working parts fully enclosed.

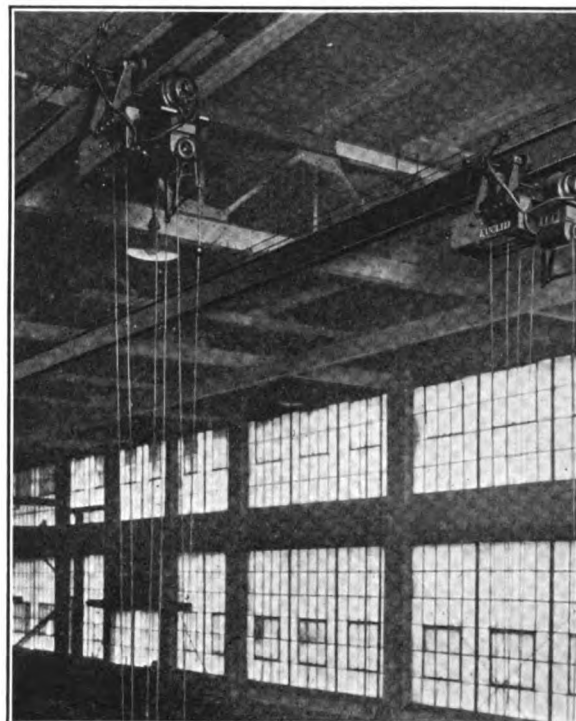
The Euclid hoist mechanism has fewer moving parts and these parts are more readily accessible than any other hoist built. Motor shelf makes it possible to use any standard motor, so purchaser can standardize his motor

equipment. Highest grade drum type controllers manufactured, very thoroughly insulated. Extra heavy fingers and segments and substantial barriers. Positive limit device. Euclid hoists are very compact, making possible their use in extremely limited headroom.

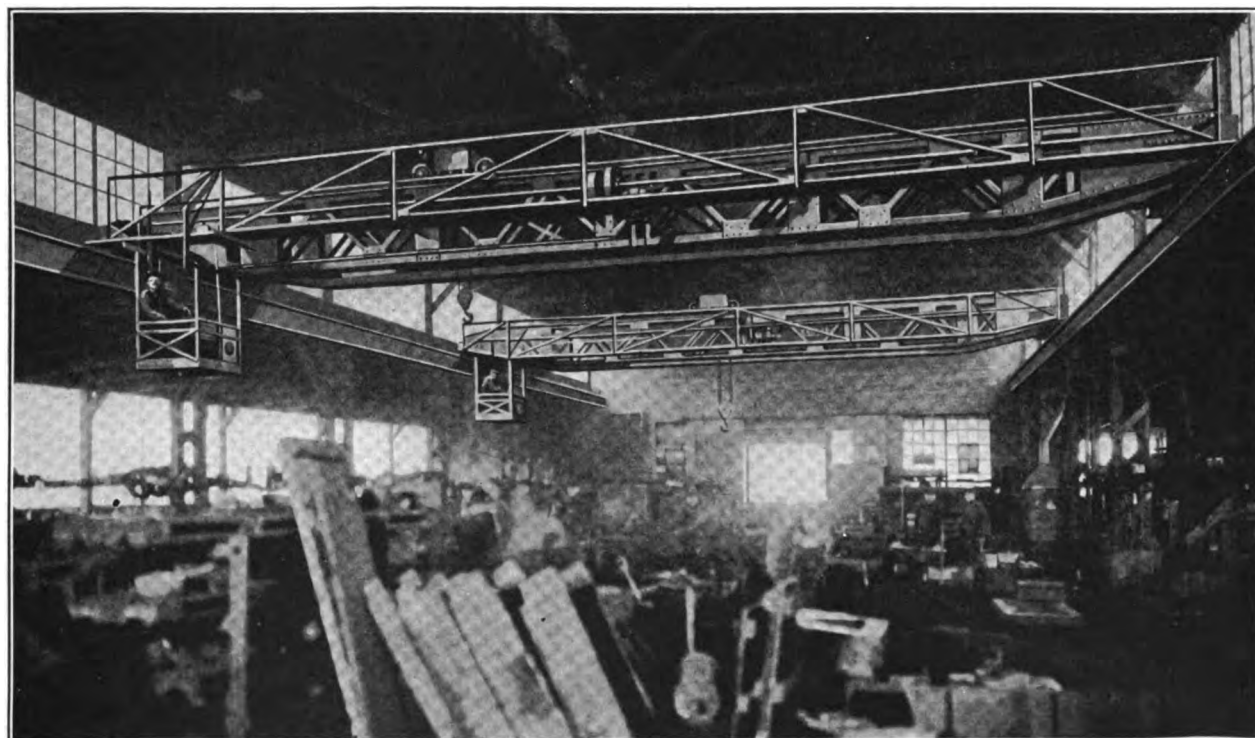
Euclid cranes and hoists are built in capacities from $\frac{1}{2}$ ton to 20 tons.



A 5-TON CAPACITY EUCLID STANDARD 2-MOTOR TYPE "H" TROLLEY HOIST



A 2-TON CAPACITY EUCLID STANDARD TYPE "D" PLAIN TROLLEY HOIST



ONE 5-TON AND ONE 10-TON OVERHEAD TRAVELING CRANE, 50-FOOT SPAN, LATTICED GIRDER TYPE

HERBERT MORRIS INCORPORATED

Manufacturers of Hoists
BUFFALO, N. Y.

FOR CANADA: THE HERBERT MORRIS CRANE & HOIST CO., LTD., NIAGARA FALLS, ONT.

Products

CHAIN HOISTS; HAND CRANES; ELECTRIC HOISTS.

Also manufacturers of Ash Hoists, Car Pullers, Jib Cranes, Portable Cranes, Jacks, Monorail Systems, Slings, Trolleys, Elevating Trucks, Winches, and miscellaneous Lifting and Shifting Machinery.

Hand Hoists

Morris hand hoists are made in half a dozen different types, of which the Morris Triple-gear chain block only is illustrated on this page.

All Morris geared hand hoists are fitted with machine cut gearing and an automatic self-lubricated brake for sustaining the load.

The workmanship is such as to give the highest possible mechanical efficiency.

The capacities are measured in tons of 2240 lbs., and every hoist is tested, before shipment, with a load 50% more than the working capacity.

Morris hand hoists may be suspended from trolleys to run on overhead track or used in conjunction with Morris jib cranes or overhead traveling cranes of the single or double beam type.

Ask for crane catalogue for clearances, dimensions, weights and reactions.

Hand Cranes

Morris hand-operated cranes are built up of rolled steel shapes so far as possible, to reduce weight to a minimum while insuring an adequate factor of safety. Roller bearings are fitted to traveling wheels, thus reducing the effort required to move cranes by 75%.

Morris hand cranes are manufactured in quantities for stock, not built one at a time for individual requirements. This method results in sound construction at a moderate cost.

Every design has behind it a wealth of experience. Modifications to suit special conditions can be arranged without difficulty and without loss of time. A standard crane possesses many obvious advantages as compared with improvised constructions.

Electric Hoists

Morris electric rope hoists are simple, compact, efficient and portable. The number of parts has been reduced to a minimum. For example, the motor and hoist frames are in one piece. Their compactness is as noticeable in the close headroom as in the small width and length. Yet all parts are easily accessible for inspection, maintenance and dismantling. High efficiency is secured by the use of machine cut spur gearing, ample sheave diameters and reasonable, well lubricated bearings.

The motor, alternating or direct current, is completely enclosed. Designed for hoisting service with high starting torque.

Two brakes give double protection to the load—one applied by powerful springs and released by a magnet; the other of the centrifugal type and acting as a governor to prevent unsafe acceleration.

Every hoist is tested with a 50% overload before shipment as a final check on the whole series of inspections and tests during manufacture.

Morris electric rope hoists may be used at a fixed point or suspended from a trolley for use on an I-beam track, jib crane or overhead traveling crane.

We shall be pleased to supply catalogues giving dimensions, weights, speeds and prices of electric hoists, trolleys or cranes.

Other Products

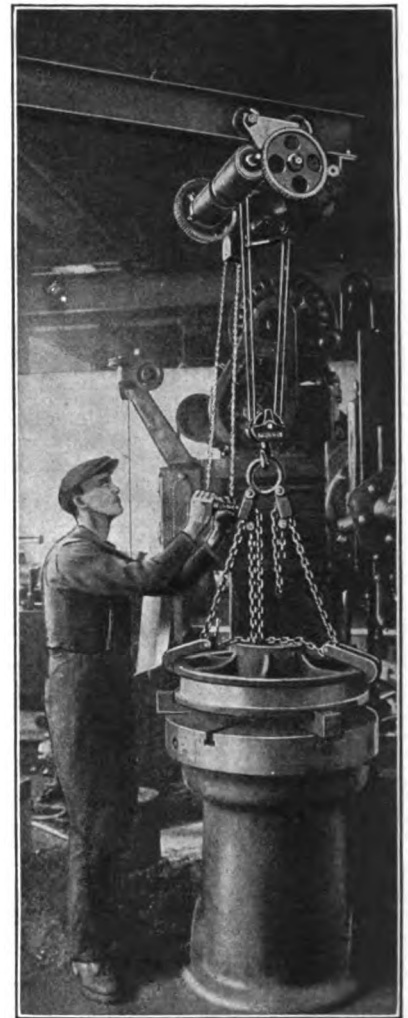
We also manufacture a great variety of other lifting and transporting machinery, this being the line in which we have specialized exclusively for the last 40 years. We invite inquiries and shall be pleased to have an opportunity to consider any handling problem no matter how simple or how complicated it may be.

Catalogues

Separate bulletins, circulars and catalogues have been issued, dealing with Morris hoists, trolleys, cranes, trucks, monorails and other standard products, and copies await your request.



MORRIS TRIPLE-GEAR
CHAIN BLOCK



MORRIS ELECTRIC HOIST

SPRAGUE ELECTRIC WORKS

OF GENERAL ELECTRIC COMPANY

Electric Hoists and Monorails

TELEPHONE
LONGACRE 0900

527-531 West Thirty-fourth Street
NEW YORK, N. Y.

BRANCH OFFICES IN PRINCIPAL CITIES

Products

SPRAGUE ELECTRIC HOISTS and MONORAILS; ELECTRIC WINCHES; WINDING DRUMS.

Also manufacturers of Motors, Generators, Electric Dynamometers, Switchboards, Panelboards, Exhaust Fan Outfits, Electric Fans, Steel Armored Cable, Flexible Steel Conduit, Galvanized Rigid Conduit, Enameled Rigid Conduit, Outlet Boxes, Armored Hose, Electric Freight Handling Machinery.

General

The SPRAGUE ELECTRIC WORKS for many years have manufactured a complete line of electric hoists and cranes in capacities from $\frac{1}{4}$ to 6 tons. They are designed to satisfy the demand for efficient lifting and carrying devices to fill the gap between the hand chain block and the large traveling cranes. The hoists and cranes are admirably suited for all industrial operations requiring the transportation of any class of material.

The hoists here described can all be equipped with cage for operator.

Complete information concerning any equipment described here will be gladly furnished on request to the nearest branch office.

I-6 Hoist

Capacity, 500 pounds on one rope;
1000 pounds on two ropes.

Totally enclosed gears.

All roller bearings.

Splash lubrication.

Push button control, which means:
accurate setting of load by inching; one hand free to adjust load; control from a remote point when handling loads of bulky dimensions.



I-6 Hoist

S-1 Hoist

This hoist is entirely enclosed and protected from dust and moisture. It is built both for direct current and polyphase alternating current circuits. Any one of a number of controllers and trolley carriages may be used in connection with it, so that a great variety of applications is possible. It is built for loads of $\frac{1}{2}$ and 1 ton.



S-1 Hoist

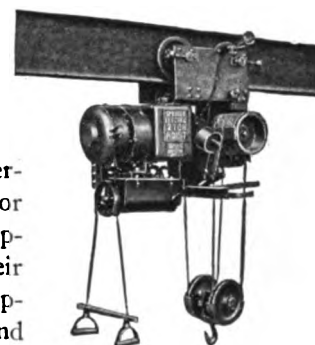
S-2 and S-3 Hoists

For loads of 2, 3, 4 or 6 tons. Both hoists are similar in design, the S-2 hoist having a maximum capacity of 8000 lbs., and the S-3 hoist a capacity of 12,000 lbs.

W-1 and W-2 Hoists

For loads of 1, 2, 3, 4 and 6 tons. Both hoists are similar in design, the W-1 built in capacities of from 2000 to 4000 lbs. and the W-2 in capacities of from 3000 to 12,000 lbs.

The gears are entirely enclosed, run in grease, and the machines are weather-proof. They can be used for hoisting work of any description within the limit of their capacity, and are especially applicable to foundry work and for use in exposed situations.



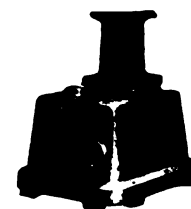
W-1 AND W-2 SPRAGUE
ELECTRIC HOIST

Vertical Electric Winch

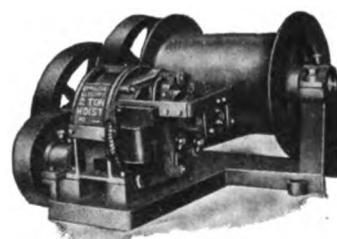
The entire mechanism is enclosed in the cast iron base, insuring complete protection from the elements or rough handling, but all parts are easily accessible for inspection by raising hinged covers on sides.

The motor is direct or alternating current, and is geared to winch head through a triple reduction gearing. The gears are steel castings and pinions steel forgings, all teeth being cut from solid. All bearings are of best bearing bronze and are lubricated with grease by compression cups.

Built in capacities of from 2000 lbs. pull at 150 ft. per minute, to 12,000 lbs. pull at 25 ft. per minute.



VERTICAL ELECTRIC
WINCH



D-11 SPUR GEARED WINDING DRUM

Built in capacities from 1000 to 8000 lbs. pull, at speed of 100 ft. per minute. Motor is direct or alternating current, geared to drum through triple reduction gearing

SHEPARD ELECTRIC CRANE & HOIST CO.

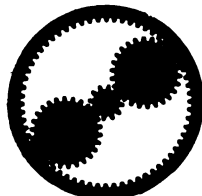
MONTOUR FALLS, N. Y.

BRANCH OFFICES
 NEW YORK, N. Y. BALTIMORE, MD. BIRMINGHAM, ALA. PITTSBURGH, PA. DETROIT, MICH.
 CHICAGO, ILL. SAN FRANCISCO, CAL. CHATTANOOGA, TENN. BUFFALO, N. Y. MONTREAL, QUE.
 LONDON, ENGLAND CHRISTIANIA, NORWAY MELBOURNE, AUSTRALIA BARCELONA, SPAIN

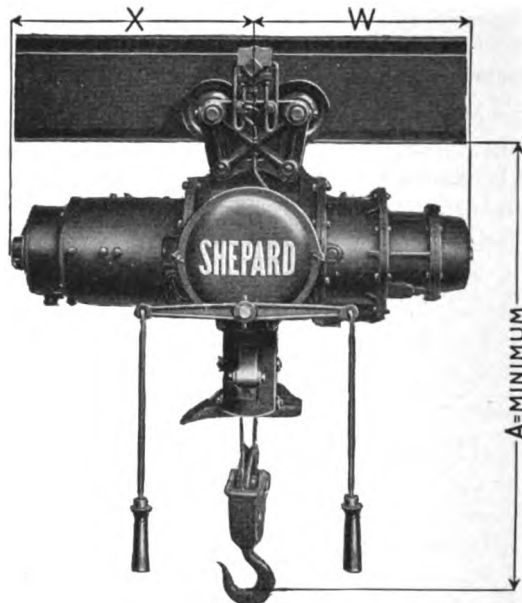
Products

ELECTRIC HOISTS and CRANES for every lifting service; DOUBLE MONORAIL TRACK; TROLLEYS; ELECTRIC BACK-GEARED WINCHES; ELECTRIC DOCK WINCHES; ELECTRIC SHIP WINCHES.

Also manufacturers of Electric Cargo Cranes; Electric Capstans.



TRADE MARK



"LIFTABOUT" HOIST

Co-operative Service

The variety of the Shepard line permits the selection of efficient apparatus specialized to particular needs. This company will be glad to plan, design, and help in any way to determine where real savings can be made.

Shepard Electric Hoists

To meet the various handling requirements of many and varied industries, many types and capacities have been developed during the past 18 years, including 1-motor and 2-motor floor controlled hoists, and 2-, 3- and 4-motor cage controlled hoists, ranging in capacities from $\frac{1}{2}$ to 10 tons.

Hoists for stationary service, and for electrifying the hoist motion of hand cranes, are built in capacities up to 20 tons.

Thorough automatic lubrication, dirt exclusion, and permanence of alignment, all so necessary in hoisting apparatus, are provided.

The compact construction of Shepard apparatus permits the use of crane gearing and brakes in electric hoists, and back geared motors, providing a great variety of types and wide interchangeability with a minimum number of parts.

DIMENSIONS AND CAPACITIES, LIFTABOUT HOIST, D. C.

Class or frame, size	Capacity, lbs.	Hoisting speed, f.p.m.	Number of ropes	Height of lift, ft.	Dimensions, ft.-in.				Shipping weight, lbs.
					A	X	W	Extreme width	
H	1000	24	2	16	2-7	1-4 $\frac{3}{4}$	1-7 $\frac{1}{2}$	2-3	565
I	2000	24	?	20	2-11 $\frac{1}{2}$	1-9	1-11 $\frac{1}{2}$	2-5	870

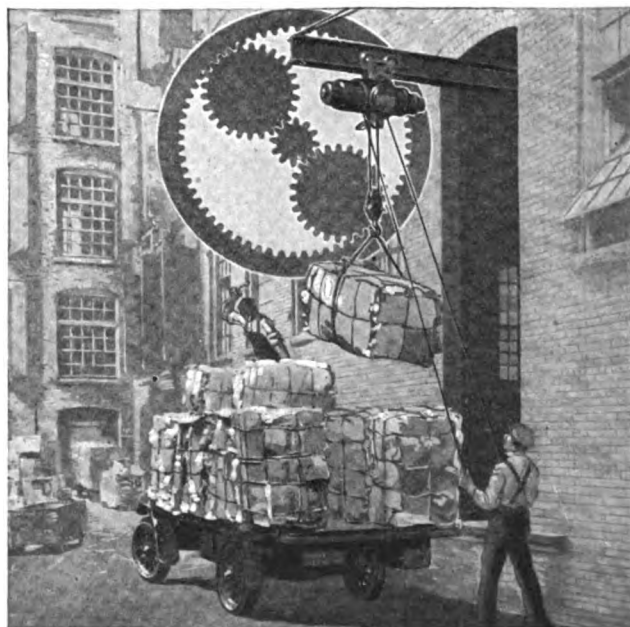
Shepard "LiftAbout" Electric Hoist

The development of the "LiftAbout" provides an efficient and highly economical means for moving individual parts or materials in bulk about the factory, and greatly facilitates the loading of finished products for shipment.

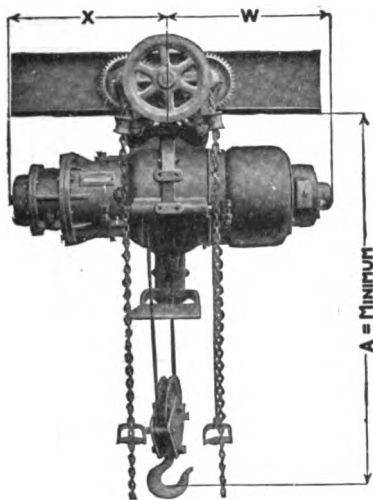
The surprisingly low cost of the "LiftAbout" brings it easily within reach of any manufacturer, and the savings effected through its use, compared with the cost of manual labor for the same purpose, will quickly absorb the initial investment and continue to pay big dividends in money and time saved. It cuts truck loading time, which means more trips a day for each truck.

The "LiftAbout" is a rugged hoist built for endurance and the construction throughout is designed to meet the most exacting requirements of continuous service and rough usage. The motor (either alternating or direct current) is designed especially for hoisting service, and the hoist in other respects embodies exclusive features that have contributed to the success and extensive use of Shepard electric hoists.

Made in two sizes for capacities of 1000 and 2000 lbs.



THE "LIFTABOUT" IN ACTION

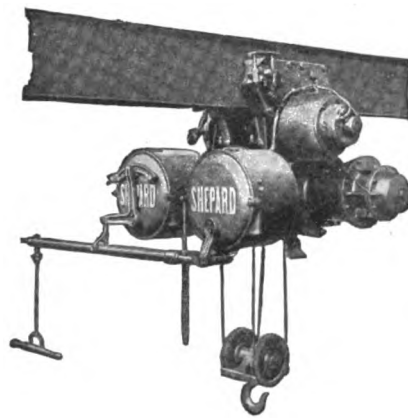


FORM 1 HOIST WITH GEARED TROLLEY

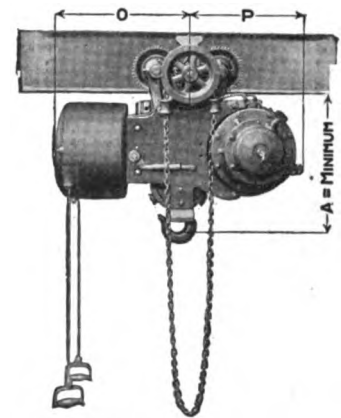
Built in capacities of from 1 to 20 tons and furnished with plain, geared, or motor driven trolley. Most frequently used type for runway and single I-beam crane service

DIMENSIONS AND CAPACITIES, FORM 1 HOIST, D.C.

Class or frame, size	Capacity, tons	Hoisting speed, f.p.m.	Number of ropes	Height of lift, ft.	Dimensions, ft.-in.				Shipping weight, lbs.
					A	X	W	Extreme width	
A 4	1, 2, 3	40, 20, 13	2	20, 10, 16	3-4 1/2	1-10 3/4	1-11	2-9 3/4	1140
B 6	3, 4, 5	20, 15, 12	2	22	4-2 1/2	1-6 7/8	1	3-7	2150
B10	4, 5, 6	25, 20, 17	2	22, 22, 20	4-3 3/4	1-6 7/8	1-2 1/4	3-11	2150
C12	5, 7 1/2, 10	26, 17, 13	2	23	5-5 3/4	1-3	1-5 3/4	4-7 3/4	4220
C10	7 1/2, 10, 12 1/2	27, 20, 16	2	23	5-5 3/4	1-3	1-7 3/4	4-7 3/4	4470



FORM 23 HOIST WITH MOTOR DRIVEN TROLLEY
Can be equipped with outrigger control

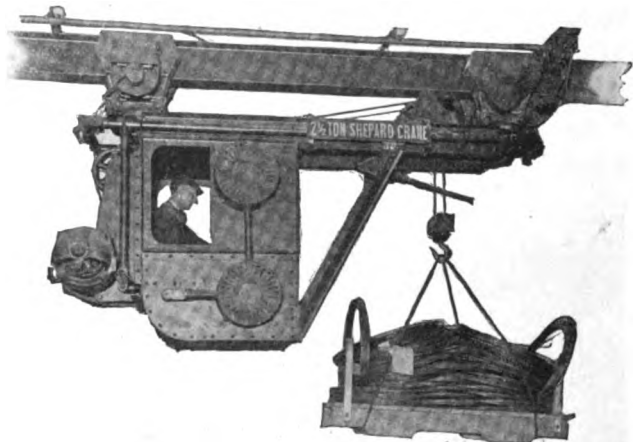


FORM 23 HOIST WITH GEARED TROLLEY

A special combination of hoisting unit, controller and trolley, which permits maximum lift; cuts in half normal distance from hook in its highest position to runway beam

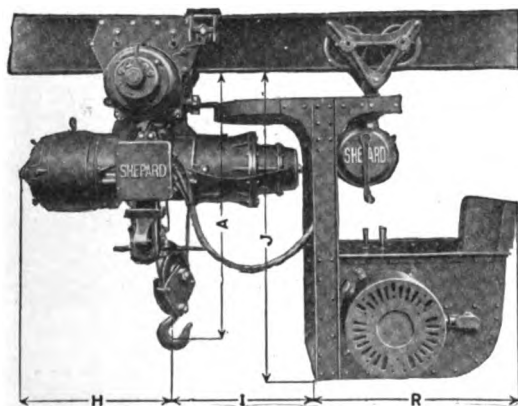
DIMENSIONS AND CAPACITIES, FORM 23 HOIST, D.C.

Class or frame, size	Capacity, tons	Hoisting speed, f.p.m.	Number of ropes	Height of lift, ft.	Dimensions, ft.-in.				Shipping weight, lbs.
					A	O	P	Extreme width	
A 4	1, 2, 3	40, 20, 13	2	20, 20, 16	2-3 1/2	1-9 3/4	1-7 3/4	3-11 3/4	1220
B 7 1/2	3, 4, 5	25, 20, 15	2	26	3-1	2-4 1/2	2-2	5-4 1/2	2470
B10	4, 5, 6	25, 20, 17	2	26	3-1	2-8 3/4	2-2	5-4 1/2	2770



FORM 24 CAGE CONTROLLED HOIST

This type of hoist is adapted to general material handling where heavy monorail service is required. Furnished also with two hooks, making it adaptable for handling long flexible loads



FORM 25-1 D. C. MONORAIL HOIST

For light and normal monorail duty; cage can be enclosed where necessary
Short over-all length of distinct advantage on short transfer cranes

DIMENSIONS AND CAPACITIES, FORM 25-1 HOIST, D.C.

Class or frame, size	Capacity, tons	Hoisting speed, f.p.m.	Trolley speed, f.p.m.	Number of ropes	Height of lift, ft.	Dimensions, ft.-in.					Shipping weight, lbs.
						A	J	II	I	Ex- treme width	
A 4	1, 2	40, 20	225, 350	2	20	3-9 1/2	4-10	2-0	2-1 1/4	3-1	2630
B 6	3, 5	20, 12	225, 350	2	22	4-8 1/2	5-9	2-3	3-1	3-6	4550
C10	5, 10	26, 13	225, 350	2	23	6-0	6-1	2-8 1/2	3-11 1/2	3-6	7580



FORM 25 HOIST OPERATING ON TRANSFER CRANE

Form 25 hoist used in conjunction with a Shepard transfer crane. This combination is wide in its range of operation and may be worked out to touch any point in or out of the plant

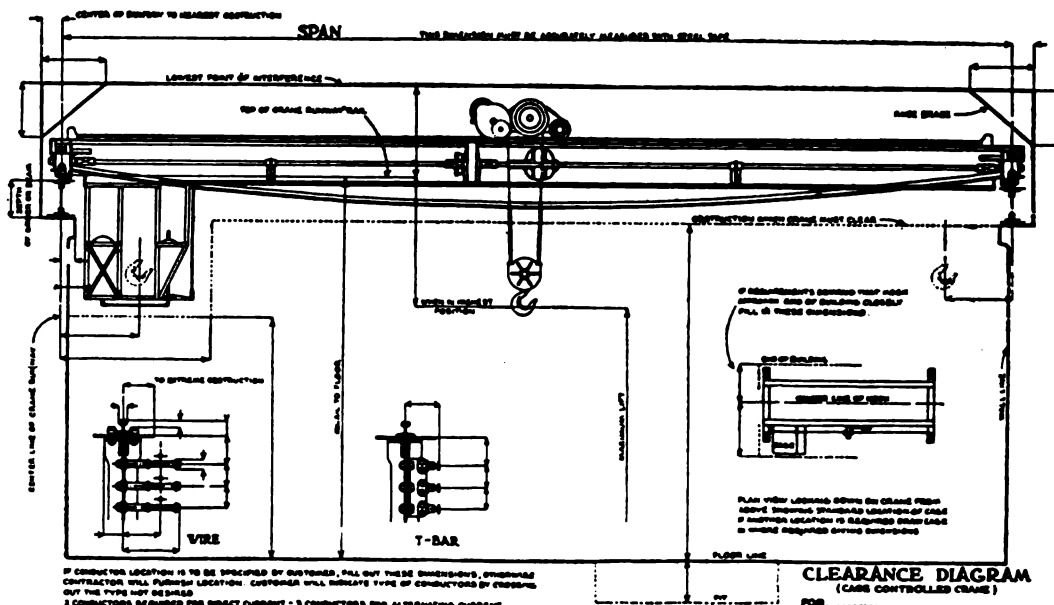
Electric Cranes

During the 18 years of crane building, no fundamental changes have been made in the original Shepard design which has proved so satisfactory.

This design provides complete dirt exclusion, thorough automatic lubrication, and permanence of alignment, secured by locating steel gearing and multiple disc type brakes within cylindrical frames, completely protected, and protecting operators and workmen.

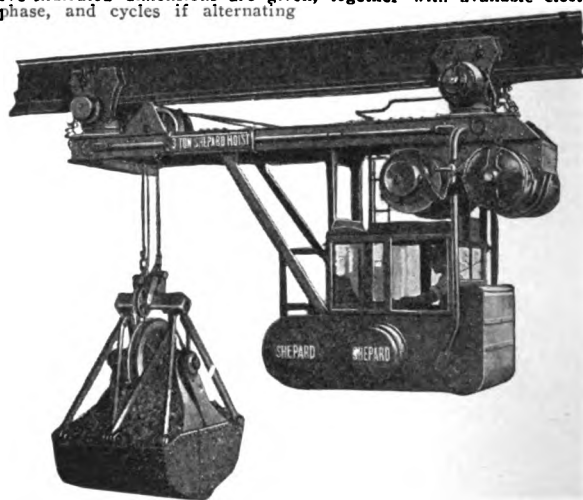
The Shepard line specializes on fully developed cranes of the highest quality in capacities of from 1 to 50 tons. The 1-ton capacity is as complete in every detail as any heavier crane; groups of small units can be handled as profitably as heavy single units.

Styles—Standard 3-motor cage controlled and double hook traveling cranes; grab bucket, single I-beam, jib bracket and transfer cranes; also various special types.

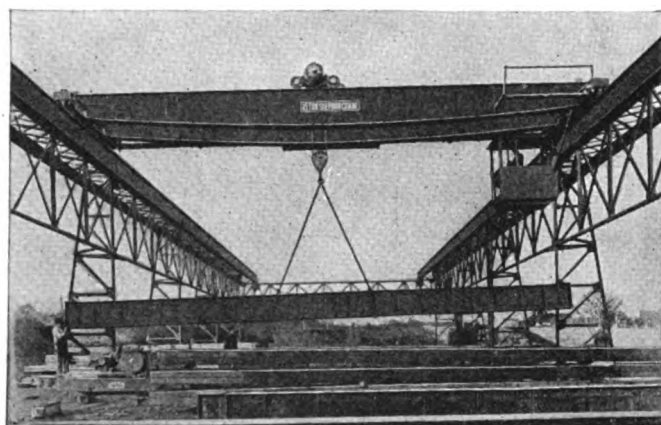


CLEARANCE DIAGRAM OF CAGE CONTROLLED CRANE

Time may be saved in making quotations if the above indicated dimensions are given, together with available electric current (voltage), phase, and cycles if alternating

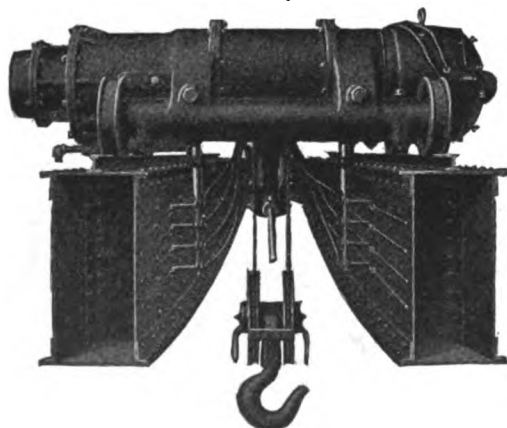


GRAB BUCKET MONORAIL HOIST, FORM 19-13



SHEPARD ELECTRIC TRAVELING CRANE

With one hoisting trolley; cranes also equipped with two trolleys working together or as separate units



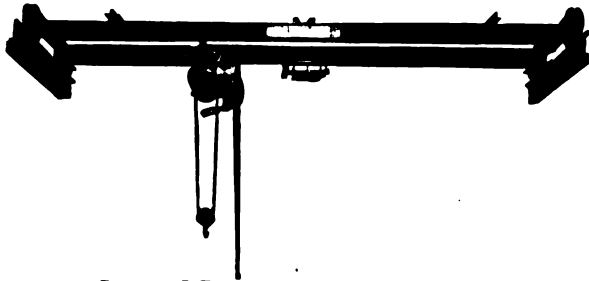
STANDARD TYPE CRANE TROLLEY

Provides bath lubrication, complete dirt exclusion, and permanent alignment for gearing, brakes and motor



TWO FORM 19-13 MONORAIL HOIST. OPERATING ON TRANSFER CRANES

This type of hoist provides a flexible, efficient, and labor saving means of unloading, storing and carrying coal into powerhouses



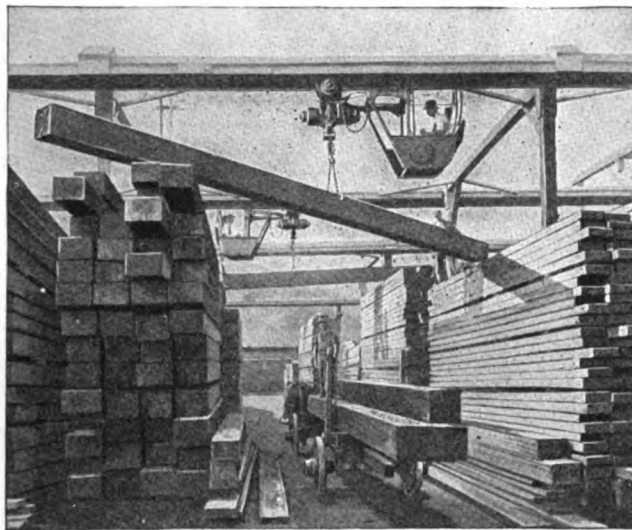
SINGLE I-BEAM WITH FORM 1X HOIST

Shepard single I-beam cranes with latticed outrigger construction combine double girder rigidity with single I-beam lightness. Widely used over foundry and machinshop side floors for capacities of 1 to 5 tons, and for medium and short spans



FORM 18 HOIST

This type of hoist has two hooks. Illustration shows hoist carrying automobile cased for export shipment, and a section of monorail runway



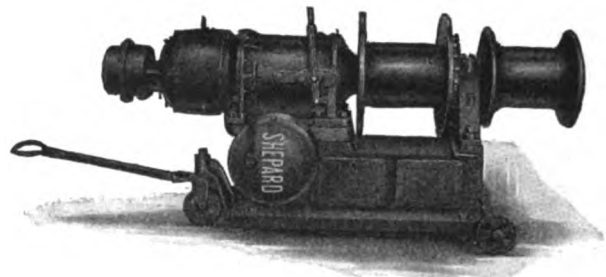
FORM 25 HOIST HANDLING HEAVY TIMBERS

Extra controllers can be mounted on special orders for magnets and buckets

Electric Cargo Winches

The electric cargo winch is a recent development for use on ships and piers. Because of its closed-in construction, it is especially desirable for this purpose, and no further waterproofing is necessary. The mechanical features of the Shepard hoist are embodied in this winch which is equipped with the Shepard mechanical load brake.

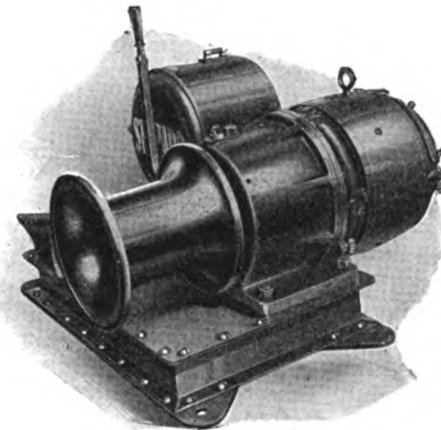
The pier winches are mounted on wheels so as to make them portable. These winches can be furnished for both alternating and direct current. Dimensions and complete information furnished on request.



ELECTRIC CARGO WINCH

Electric Back Geared Winch

A compact weatherproof winch, with running parts completely enclosed. Its uses are manifold in and about industrial plants.



ELECTRIC BACK GEARED WINCH

CAPACITIES AND DIMENSIONS

Class or frame, size	Pull on single line, lbs.	Speed of overhaul, f.p.m.	Proper size manila rope, in.	Shipping weight, lbs.	
				With base	Without base
A4	800	125	$\frac{3}{8}$	820	650
B10	1800	140	$1\frac{1}{4}$	1890	1630
C20	3500	140	$1\frac{3}{4}$	3360	3010

Shepard Double Monorail Track

T-rails may be provided for the hoist to run on, thus giving a hard steel wearing surface, rather than the soft steel, the kind from which I-beams are made.



SHEPARD DOUBLE MONORAIL TRACK

The track is attached to the I-beams by means of bolts and spreader castings, which make it unnecessary to drill the beam for the reception of this track. It also permits of using larger area bearings in the trolley wheels, thus insuring greater durability and longer life.

THE LOUDEN MACHINERY CO.

Manufacturers of Overhead Carrying Systems

163 Court Street
FAIRFIELD, IOWA

Products

OVERHEAD CARRYING SYSTEMS: Overhead Track, Push and Pull Traveling Cranes, Swinging Cranes, Coal Carriers, Ladle Carriers, Twin Chain Hoists, Track Elevators, Overhead Track Scales.

Co-operative Service

Our engineers are at your service to help plan an installation to fit special requirements. These men come in contact with many different classes of installations where various kinds of work and materials are handled and extensive systems of track arrangements are necessary. As a result, this department is a clearing house for ideas on this line of work. Send for illustrated catalogue showing installations for almost every conceivable class of conveying work.

Advantages of Louden Overhead Equipment

Time and Labor Saving—One man can push one or more loaded carriers with a ton load as easily as four or five men could handle the same load on a floor truck. One man easily picks up, transports and deposits any size or shape of material weighing 1 ton in less time than a gang of men could do the same work without the Louden overhead equipment. Re-handling is brought down to a practically irreducible minimum.

As compared to any type of floor transportation, materials are brought to and removed from machines in less time. This easier service to and from machines enables the same machines to produce more. There is no congestion of aisles. Routing of material is made both simple and certain.

Money Saving—The cost of merely transferring materials is reduced 50% to 60%. Besides this direct saving may be mentioned the following:

Upkeep of floors due to trucking wear eliminated.
Production of all departments served is increased.
Accidents to both men and products are reduced.
Low in cost.

Installation—Easy to install. Track can be bent cold on job to meet any special requirements.

Description of Louden Overhead Equipment

Track and Fittings—The track is made from No. 1 re-rolled rails, is especially adapted for carrying loads up to 2000 lbs. and can be curved to fit all requirements. The tread is re-rolled so as to reduce friction to a minimum.

Switches—No matter how high the switch may be placed, it is easily operated by two cords which are let down to a height convenient to reach. Switches are reversible, right or left, and made to serve 2, 3, 4, 5 or 6 side tracks. All open ends of tracks are protected by automatic safety guards, making it impossible to run a carrier off the track. Crossover switches and turntables enable the Louden overhead system to meet any possible service requirements in the way of routing material.

Carriers—Made in 2-, 4-, 8-, and 16-wheel sizes with bumpers to permit pushing any number or all sizes of carriers in trains without "climbing." All carriers are roller bearing. Strong truck swivel castings give even the 16-wheel carrier perfect freedom in taking the sharpest curves.

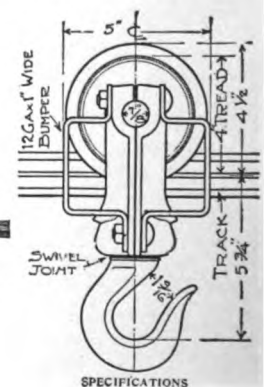
Special platforms, tubes, racks, hooks, etc., can be made to use with any of these carriers.



4-WHEEL CARRIER



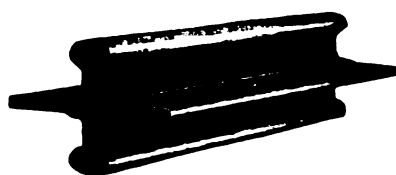
8-WHEEL CARRIER
Capacity, 1000 lbs.



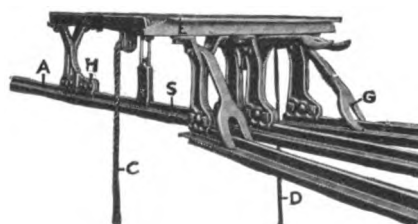
2-WHEEL CARRIER



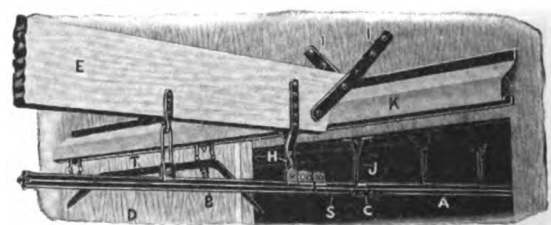
ADJUSTABLE LINK
TRACK HANGER
Odd inch-lengths up to
61 in.



TRACK



3-WAY SWITCH



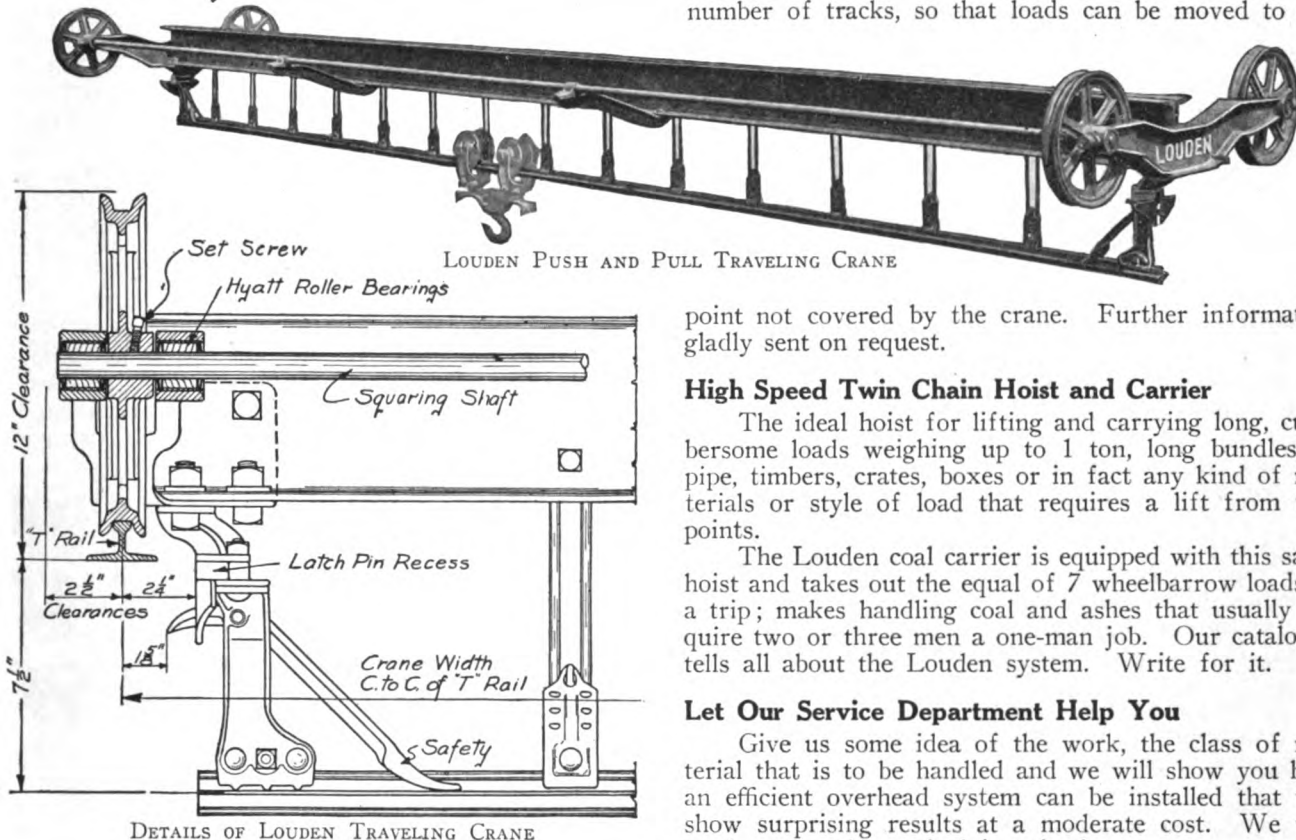
AUTOMATIC OVERHEAD TRACK OPENER

When door is opened, this Louden overhead track is automatically connected. When door is closed, the track is automatically opened. Track opening in no way interferes with fire doors.

Louden Push and Pull Crane

Runs so easily that even the heaviest loads can be

With a Louden push and pull crane you can cover every foot of floor space. It can be connected to any number of tracks, so that loads can be moved to any



DETAILS OF LOUDEN TRAVELING CRANE

moved diagonally by merely pushing or pulling the load. The operator may well forget that his load travels on a trolley and a crane. Even when heavy awkward loads have to be placed very accurately, placing is done by merely pushing on the suspended load—the crane and trolley do the rest.

This is a sturdy light weight crane requiring only an inexpensive runway track, low in cost yet it is made so strong, and its Hyatt roller bearings are so well protected from dust, that many foundries find the Louden an ideal crane for carrying molten metal.

point not covered by the crane. Further information gladly sent on request.

High Speed Twin Chain Hoist and Carrier

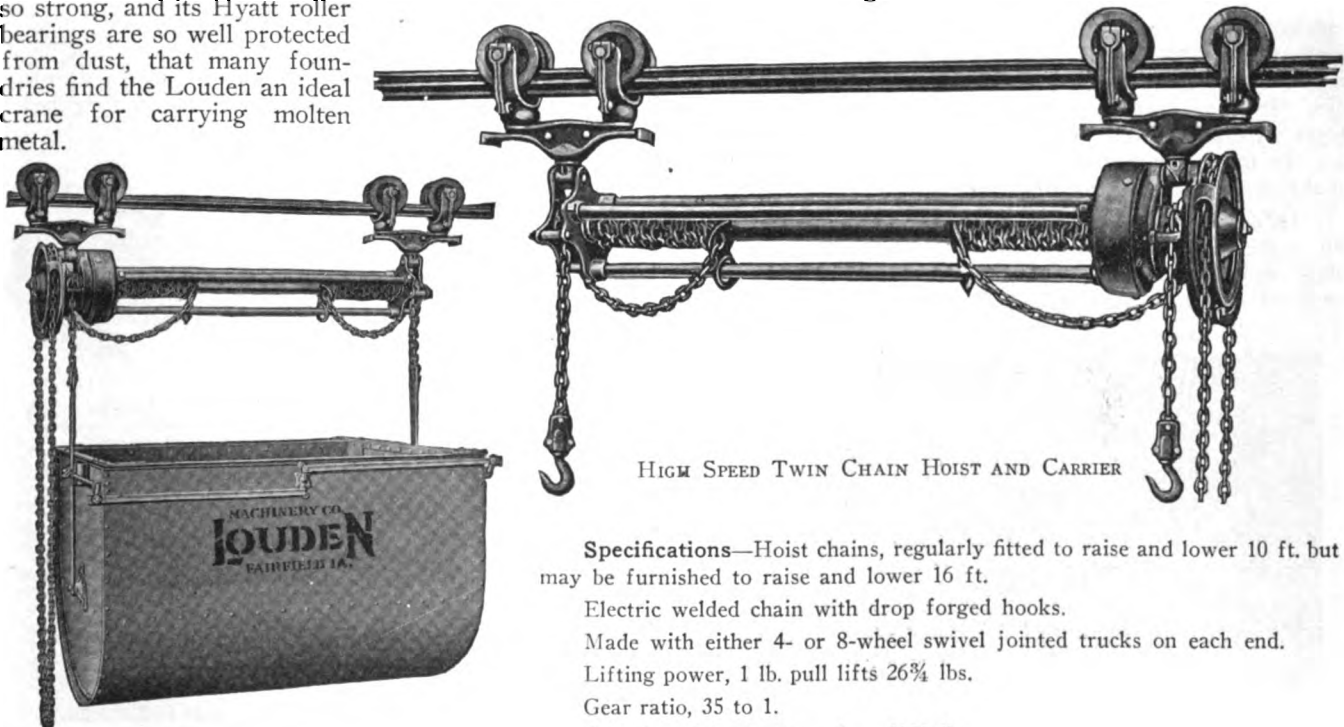
The ideal hoist for lifting and carrying long, cumbersome loads weighing up to 1 ton, long bundles of pipe, timbers, crates, boxes or in fact any kind of materials or style of load that requires a lift from two points.

The Louden coal carrier is equipped with this same hoist and takes out the equal of 7 wheelbarrow loads at a trip; makes handling coal and ashes that usually require two or three men a one-man job. Our catalogue tells all about the Louden system. Write for it.

Let Our Service Department Help You

Give us some idea of the work, the class of material that is to be handled and we will show you how an efficient overhead system can be installed that will show surprising results at a moderate cost. We will work out a plan embodying the best arrangement and ideas that will save labor, speed up the work and lessen congestion.

If you have a line of work that is somewhat out of the ordinary no doubt we can show a practical way to handle it, just as we have worked out special arrangements for many others. Let us consult with you regarding your needs. You will find the results interesting and will not be obliged in the least.



HIGH SPEED TWIN CHAIN HOIST AND CARRIER

Specifications—Hoist chains, regularly fitted to raise and lower 10 ft. but may be furnished to raise and lower 16 ft.

Electric welded chain with drop forged hooks.

Made with either 4- or 8-wheel swivel jointed trucks on each end.

Lifting power, 1 lb. pull lifts 26 3/4 lbs.

Gear ratio, 35 to 1.

Capacity of 8-wheel carriers, 1000 lbs.

LOUDEN COAL CARRIER

RICHARDS-WILCOX MANUFACTURING CO.

INCORPORATED

Overhead Carrying Systems and Warehouse Door Hardware

CABLE ADDRESS
"RICHWILCO"

AURORA, ILL.

CANADIAN FACTORY
LONDON, ONTARIO

BRANCH OFFICES

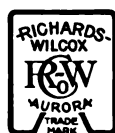
NEW YORK, N. Y., 85 Walker Street
BOSTON, MASS., 132 Pearl Street
LOS ANGELES, CAL., 503 Equitable Building
ST. LOUIS, MO., 1735 Boatmen's Bank Building
CLEVELAND, OHIO, 459 Hippodrome Annex

PHILADELPHIA, PA., 507 Arch Street
CHICAGO, ILL., 166-168 West Lake Street
SAN FRANCISCO, CAL., 626 Underwood Building
MINNEAPOLIS, MINN., 321 Plymouth Building
INDIANAPOLIS, IND., 423-424 Occidental Building

Products

R-W "OVER-WAY" TROLLEY and I-BEAM OVERHEAD CARRYING SYSTEMS; LIFT WAREHOUSE DOOR HARDWARE; FIRE DOORS, SHUTTERS, and FIXTURES.

Also manufacturers of Manually Operated Cranes; Jib Cranes; Portable Cranes; Hoists; Store Shelves and Ladders; Angle Iron Door Frames; Warehouse Door Hangers; Door Hangers and Track for Sliding Doors of all kinds and weights; Garage Door Outfits; Elevator Door Hangers; Elevator Door Closer and Check; Sliding Partition Door Hardware; Swing Door Closers and Checks; Hardware Specialties; Expansion Bolts and Expansion Shields.



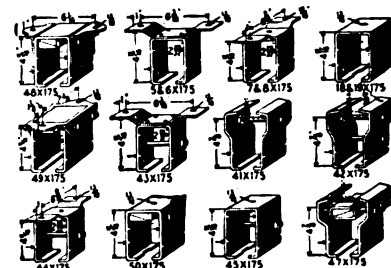
used for storage purposes. Send detail of overhead construction, so proper brackets will be furnished.

Co-operative Service—On receipt of requisite information, detailed drawing of equipment to meet requirements will be submitted for approval.



TROLLEY OVERHEAD ROLLER BEARING SWIVEL CARRIER

Nos. 100-11 and 100-13. For curved track. Made for 4 sizes of track and 6 capacities



TROLLEY OVERHEAD CARRYING TRACK BRACKETS

"Over-Way" Trolley and I-Beam Overhead Carrying Systems

The "Over-Way" conveying equipment constitutes the most efficient labor saving devices manufactured for any size factory or machineshop for handling loads up to 4 tons. The tracks are in a position where they are free from obstruction and always ready for instant use. Factory handling costs are reduced to a minimum, and available floor space increased by hundreds of square feet. Equipment includes overhead tracks, brackets, trolleys, carriers, hangers, switches, cross-overs, turntables and hoists.

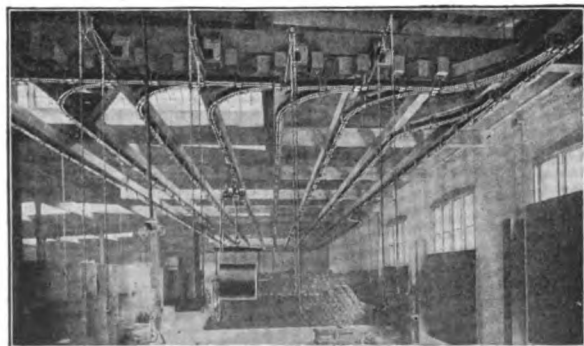
To insure proper erection, blue prints are furnished in detail and all material marked to correspond.

Information Required—Always send sketch giving correct dimensions and proposed layout of tracks. State weight and size of maximum load, whether for constant or occasional use, and whether track will be

TRACK, SPACING OF BRACKETS, SIZES AND CAPACITIES OF CARRIERS

Size of carrier							Track		Load on carrier, lbs.									
No.	Number of wheels	Diam-eter wheel in.	Length over all, in.	Bottom of track to bot-tom of eye, in.	Eye bolt				125	250	500	750	1000	1250	1500	2000	2500	3000
					Diam. stem, in.	Diam. eye, in.	Spacing of brackets according to load, in.											
100-10	16	3	44	13¾	¾	1½	175	13	36	30	18	12	30	27	21	18	15	12
							275	12										
							375	10										
100-11	8	3	21	9¾	¾	1½	175	13	36	30	18	12	30	27	21	18	15	12
							275	12										
							375	10										
100-12	16	2½	31	10	⅝	1¾	75	14	36	30	18	12	30	27	21	18	15	12
100-13	8	2½	14	6¾	1½	1½	75	14										
100-14	4	2½	7	4½	¾	1½	75	14										
100-15	4	3	9	5½	¾	1¾	175	13	36	30	18	12	30	27	21	18	15	12
							275	12										
							375	10										

Spacing of brackets according to load, in.



PARALLEL TRACKS WITH CURVES AND SWITCHES USED BY BARRETT COMPANY, CHICAGO, ILL., FOR HANDLING ROOFING PAPER



OVER-WAY STANDARD I-BEAM TROLLEYS
Axles operate on ball bearings



OVER-WAY UNIVERSAL CLAMP

For attaching supporting brackets to I-beams. Not necessary to drill holes in I-beam. Can be attached at any point

OVER-WAY STANDARD I-BEAM TROLLEYS

I-beam, No. and size, in.	Capacity, lbs.	Diameter wheels on tread, in.	Smallest radius of curve, in.	Diameter center pin, in.	Distance top of center pin to bottom of beam, in.	Width, over all, in.	Length, of switch tongue, ft.
925-5	1000	3 1/2	21	3/4	1 1/4	6 1/4	6
925-6	2000	4 1/2	21	3/4	2 1/4	7 1/2	6
925-7	3000	5 1/2	34	1 1/4	2 1/2	8 1/2	6
925-8	4000	6 1/2	36	1 1/4	2 3/4	9 1/2	6
925-9	6000	7 1/2	42	1 1/2	3	10 1/2	6
925-10	8000	8 1/2	48	1 3/4	3 1/4	11	6

Always specify by number, stating size and weight of I-beam.

Fire Doors, Shutters, and Fixtures

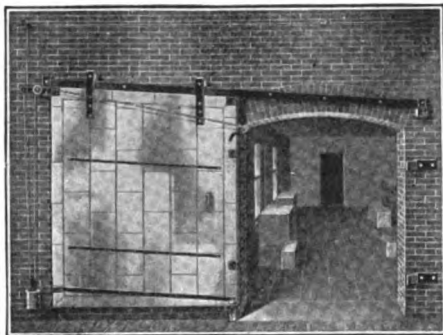
We manufacture a complete line of fire doors and fire door equipment, including: inclined and level track, flat or round; vertical and horizontal sliding doors; swinging doors, single and double. Also fire shutters and trap fire door fixtures.

Fixtures marked with * in table are approved by the Underwriters' Laboratories, Inc. Hardware furnished to meet special requirements.

Corrugated sheet metal fire doors lined with asbestos, approved and labeled under the direction of National Board of Fire Underwriters.

Tin clad fire doors, approved and labeled under the direction of National Board of Fire Underwriters.

For more detailed data, ask for fire door hardware catalogue. Blue prints sent on request.



No. 102 MONARCH FIRE DOOR FIXTURES

Recommended where headroom exceeds 3 ft. Two fusible links, one in opening and one near ceiling. Door closes by gravity

FIRE DOOR FIXTURES

Type of door	Fixture No.	Round or flat track	Clearance above top of opening, in.	Clearance required at side of opening, in.	
				Where doors slide or swing	Opposite side
Incline track sliding door	102*	Flat	14†	Width of opening + 22	13½
	201*	Flat	14†	Width of opening + 19	13½
	645*	Round	12†	Width of opening + 18	13½
	646*	Round	12†	Width of opening + 15	13½
Level track sliding door	303	Flat	14†	Width of opening + 19	19
	304	Flat	9†	Width of opening + 19	19
Sliding doors in pairs	204*	Flat	14†	Width of opening + 19	
	604*	Round	12†	Width of opening + 15	
Single swing doors	206		9	10	3½
	406*		none	11	3½
	606		none	3½	3½
Swing doors in pairs	306		10	10	10
	506*		10	11	11
	706		3½	3½	3½
Side wall required					
				Doors under 300 lbs.	Doors over 300 lbs.
Vertical sliding doors	203	Flat	Height of opening + 19	15 and 21	21 and 28
	603	Round		16 and 22	22 and 29

Adjustable hanger can be furnished with Nos. 102, 201, 204, 303, 645, 646 and 604 fixtures, and requires 3 in. more headroom above top of opening than rigid hangers.

*Approved and labeled under direction of National Board of Fire Underwriters.

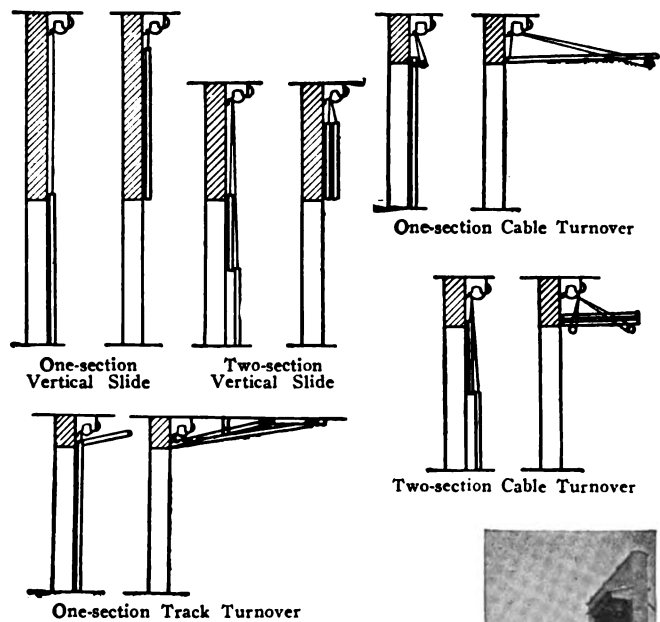
†For arched top openings add ¾ in. for each foot of track back of the center of the opening, to the dimension given. For square top opening add ¾ in. for each foot of track back of edge of opening towards which the door slides in closing, to the dimension given.

Lift Warehouse Door Hardware

Kinds of Doors—One-section turnover door with track supporting top of doors; one-section turnover door, top of door supported by cables, suitable for doors not over 8-ft. high; one-section vertical door; two-section vertical door as illustrated; two-section turnover door.

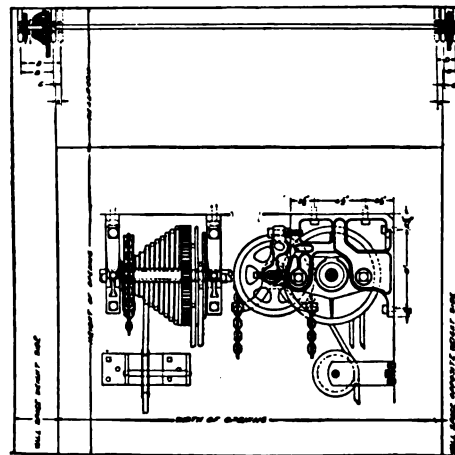
All of these doors are counterbalanced and operated with geared hand chain hoist. Openings should be fitted with steel channel or angle jambs to provide place for attaching hardware.

Used for factories, warehouses, car shops, piers and similar structures having high doorways which require ponderous doors.

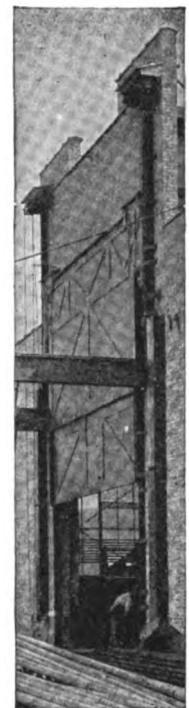


VERTICAL SECTIONS OF VARIOUS STYLES OF LIFT WAREHOUSE DOORS

How to Order—Furnish width, height, thickness and weight of doors; space between jamb and sidewalls or nearest obstruction on each side; and space above opening.



DIMENSION DIAGRAM LIFT WAREHOUSE DOOR



TWO-SECTION R-W LIFT DOOR AT THE UNIVERSAL TRACTOR WORKS, MOLINE, ILL.

LIFT WAREHOUSE DOOR

Type of door	Catalogue No.	Maximum height of opening, ft.	Lap of door over opening, in.	Minimum side wall space required, in.		Minimum space above opening, in.	A in.	B in.	C in.	D in.
				Weight side	Opposite side					
One-section vertical slide	403	16	2	13	4	Height of opening plus 20	0	12½		
Two-section vertical slide	503 standard	16	2	13	4	Half height of opening plus 20	1	13½		
	503 special	Over 16	2	13	4		0	12½		3½
One-section cable turnover door	349	8	2	13	4½	30		9½	5½	
Two-section cable turnover door	449	16	2	17	8	30		15	1	6½
One-section track turnover door	249	16	2	13	5½	20		7½	2½	

WORCESTER TRAM RAIL CO.

Manufacturers of Overhead Carrying Systems

18 T Wharf
BOSTON, MASS.

Products

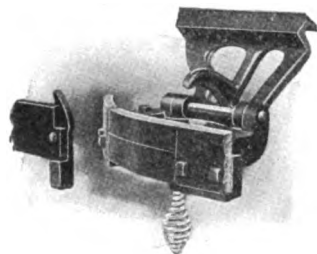
OVERHEAD CARRYING SYSTEMS: TRACK SWITCHES, HANGERS, TROLLEYS, and ACCESSORIES for use in Various Manufacturing Plants, Beef Houses, Retail Markets, Cold Storage Warehouses, Rubber Plants, Macaroni Plants, Cotton Mills, Leather Industry, Automobile Plants, Bakeries, Wholesale Fish Plants, Fish Smokehouses, etc.



TRADE-MARK

Overhead Carrying Systems

Flat Rail System—We specialize in overhead carrying systems of the flat rail type. This system consists simply of flat bar steel used as track, supported by hangers, suspended from the ceiling. This form of construction permits the trolley to be removed readily and stored out of the way when not in use.



FLAT RAIL SWITCH

It is especially adapted for installations where a considerable number of switches are required. Our flat rail switch, which is an important part of this system, may be used successfully on curves of very short radius, enabling us to overcome the most difficult conditions. This system is suitable for loads not exceeding 1 ton.

"U" Rail System—For loads ranging from 1 to 2 tons we recommend the Wagner system of "U" track for which we are the New England agents.

I-Beam System—While the systems mentioned above are the best for the loads specified, we recommend an I-beam system for all loads exceeding 2 tons.

Engineering Service

Our engineers have had years of experience in this line of work and are well known in the trade. The limited space at our disposal in this catalogue makes it impossible

to show details of application of our system to the great variety of uses for which it is adapted. Consequently, when plans are being prepared for new buildings in which overhead carrying systems are required, it will be found advantageous to give our engineers the opportunity of co-operation with the architect in order to secure a satisfactory arrangement of the carrying system without interfering with the lighting or other necessary ceiling fixtures.

In many cases we have been seriously handicapped and the cost of the installation considerably increased through the failure

to consider the requirements of the carrying system until all other details had been determined.

In old buildings a careful study of the conditions by our engineers will enable us to recommend the most practical and economical arrangement of the overhead carrying equipment.



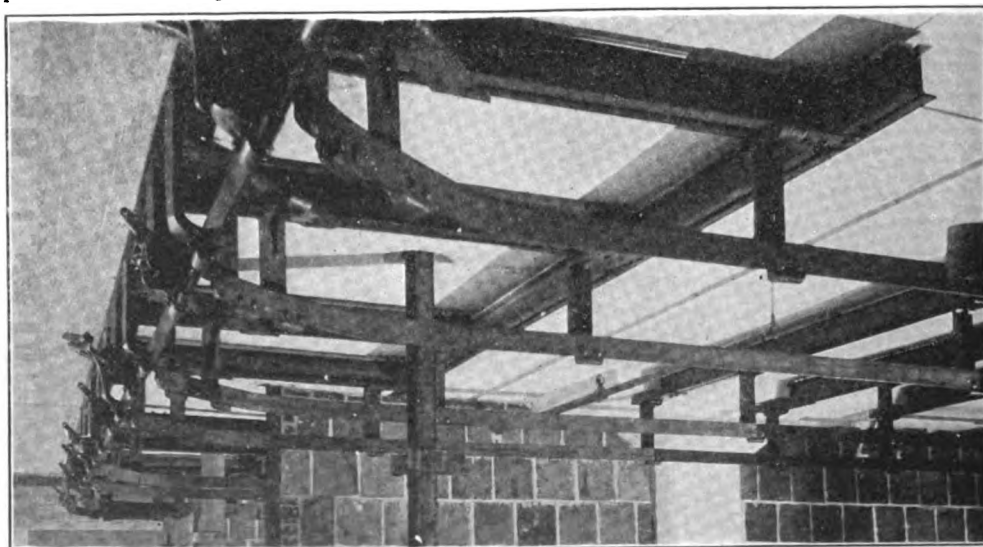
SANITARY MEAT RACK

Some Satisfied Users

C. F. Mueller Co., Jersey City, N. J.
Jewell Belting Co., Hartford, Conn.
Hannaford Bros., Portland, Me.
Riverside & Danville River Mills,
Danville, Va.
Mohican Co., New York, N. Y.
North Packing & Provision Co., Boston,
Mass.
Batchelder & Snyder Co., Boston, Mass.
C. S. Constant, Ltd., Montreal, Que.

Macaroni
Belting
Bananas
Cotton
Retail Markets
Packing House
Wholesale
Pork Packers

We have just installed 10,000 ft. of flat rail track for Harbor Commissioner, Montreal, Canada, in the new warehouse, the largest of its kind in the world, we furnishing both rail and superstructure. This job was made much simpler by our co-operation with the consulting engineer.



A RECENT INSTALLATION OF THIS COMPANY

SAMUEL OLSON & CO.

Conveying and Elevating Machinery

2418-2422 Bloomingdale Avenue
CHICAGO, ILL.

TELEPHONE
ARMITAGE 780, 781

NEW YORK OFFICE, Fifth Avenue Building

Products

CONVEYING and ELEVATING MACHINERY for handling materials of every description:

Coal and Ash Handling Elevators and Conveyors, Subveyors, Packing House Conveyors, Ice Handling Machinery, Spiral Chutes, Spiral Fire Escapes, Gravity and Belt Conveyors, Store and Office Service Conveyors, Patented Automatic and Pivoted Tray Elevators, Steel and Wood Apron Conveyors.

Also manufacturers of Power Transmission Machinery, Flour Blenders and Patented Automatic Proofers for Bakeries.

Conveyors, Spiral Chutes and Elevators

Gravity Conveyors and Spiral Chutes—Gravity conveyors afford an economic medium of distribution of commodities within plants irrespective of their characteristics. Working in conjunction with spiral chutes, an ideal system is placed at the disposal of those whose business necessitates the storing of merchandise on various floors previous to final shipping.

Bucket Elevators—They can to advantage be efficiently employed in elevating bulk commodities such as sand, gravel, cement, coal, flour, etc.

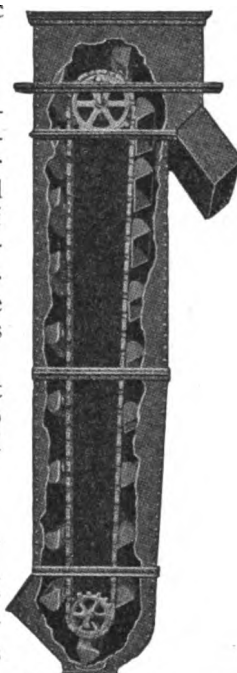
Belt Conveyors—Appropriately designed, belt conveyors are the logical equipment with which to convey any and all commodities, ranging from coal and ore to the very lightest of packages.

Automatic Elevators

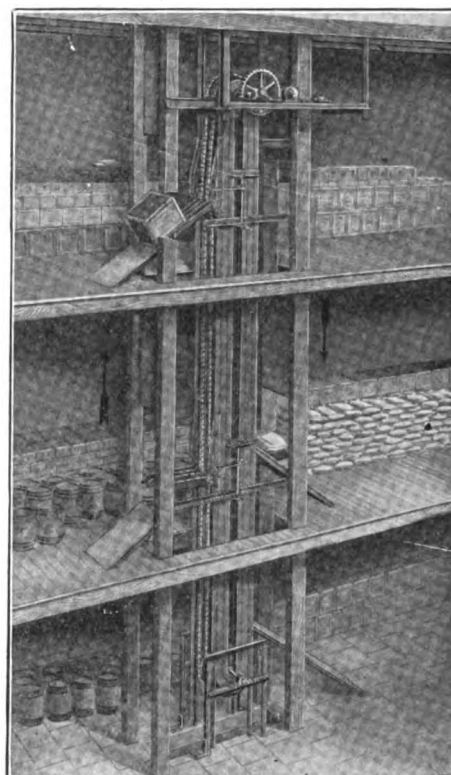
Olson automatic elevators will prove thoroughly efficient in handling packages, boxes, bags, etc., from the basement or lower floors to any desired upper floors; also for lowering packages, etc., from any floor above to any floor below. In other words, goods may be elevated on the upward moving trays unloading automatically on any desired floor, and other goods simultaneously being lowered on the downward moving trays automatically unloading at any desired floor below.

Co-operative Service

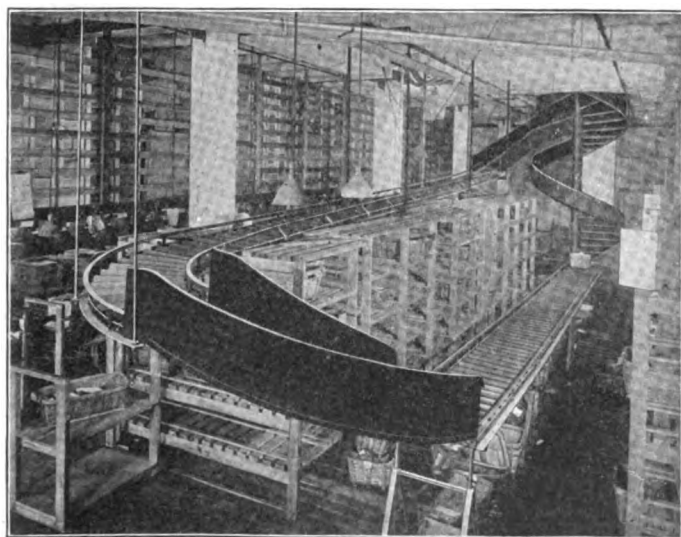
Engineers should use the vast experience of SAMUEL OLSON & Co. in solving intricate handling problems. Previous to making final decision as to any type of conveying machinery, consult this company. Recommendations particularly adapted for exact conditions will be supplied by experts.



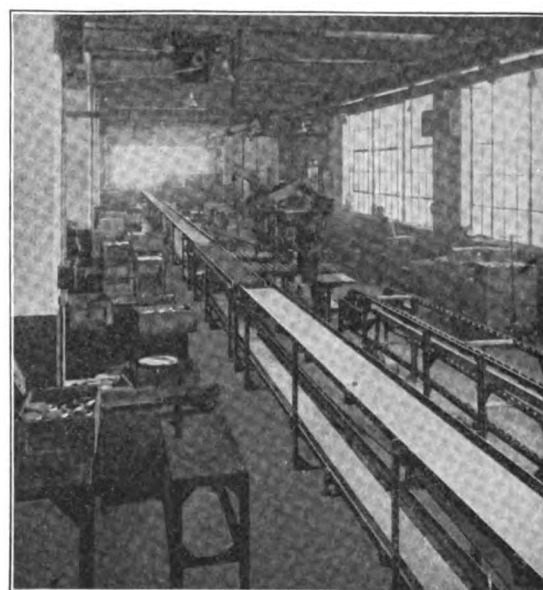
SECTION OF BUCKET
ELEVATOR



AUTOMATIC ELEVATOR



GRAVITY CONVEYORS IN CONJUNCTION WITH SPIRAL CHUTE



PORTION OF A COMPREHENSIVE CONVEYING AND
ELEVATING SYSTEM INSTALLED IN PLANT
OF AMERICAN CAN CO., MAYWOOD, ILL.

ESTABLISHED 1814

GIFFORD-WOOD CO.**Manufacturers of General Elevating and Conveying Machinery and Ice Tools**

MAIN OFFICE AND WORKS

HUDSON, N. Y.

OFFICES AND STOCK ROOMS

BOSTON, MASS., 24 Milk Street

CHICAGO, ILL., 565 West Washington Street

SALES OFFICES

NEW YORK, N. Y., 50 Church Street

BUFFALO, N. Y., Electric Building

Products

ELEVATING and CONVEYING MACHINERY.

Also Locomotive Coaling Stations and Ice Handling Equipment.

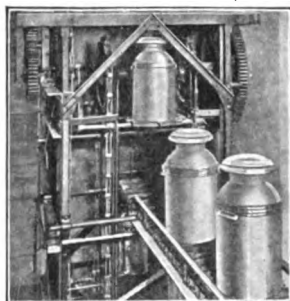
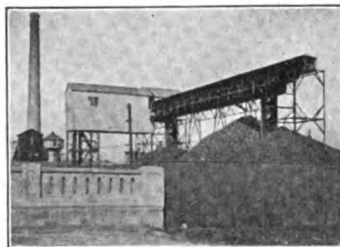
Labor Saving Elevating and Conveying Machinery

Simplicity, durability, dependability, low operating and maintenance charges and low ratio of first cost to capacity are salient features of the labor saving line of Gifford-Wood elevating and conveying machinery for factories, warehouses, etc.

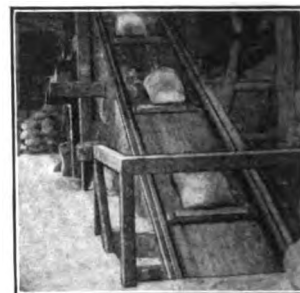
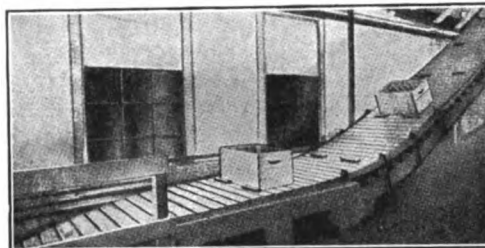
The line includes apron, belt, flight, gravity roller, hold bar, platform, slat and screw conveyors, pivoted bucket carriers, continuous bucket elevators, screening machinery, also elevators for handling boxes, barrels, bags, trucks and materials of every description for any desired capacity.

Consult Gifford-Wood engineers for a satisfactory solution of all elevating and conveying problems in the industrial plant.

Write for catalogues.

MILK CAN ELEVATOR
AND CONVEYORGRAVITY DISCHARGE ELEVATOR-
CONVEYOR FEEDING FLIGHT
CONVEYOR

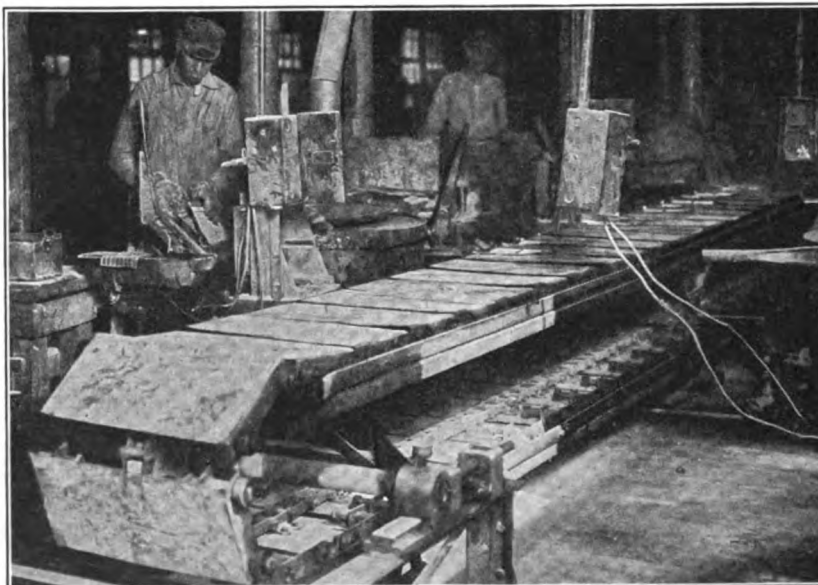
COAL POCKET

HOLD BAR CONVEYOR
HANDLING BAGSINCLINED ELEVATOR IN
TUNNEL CONNECTING
SHOP WITH FREIGHT
HOUSE

INCLINED CONVEYOR HANDLING CASED BOTTLED GOODS



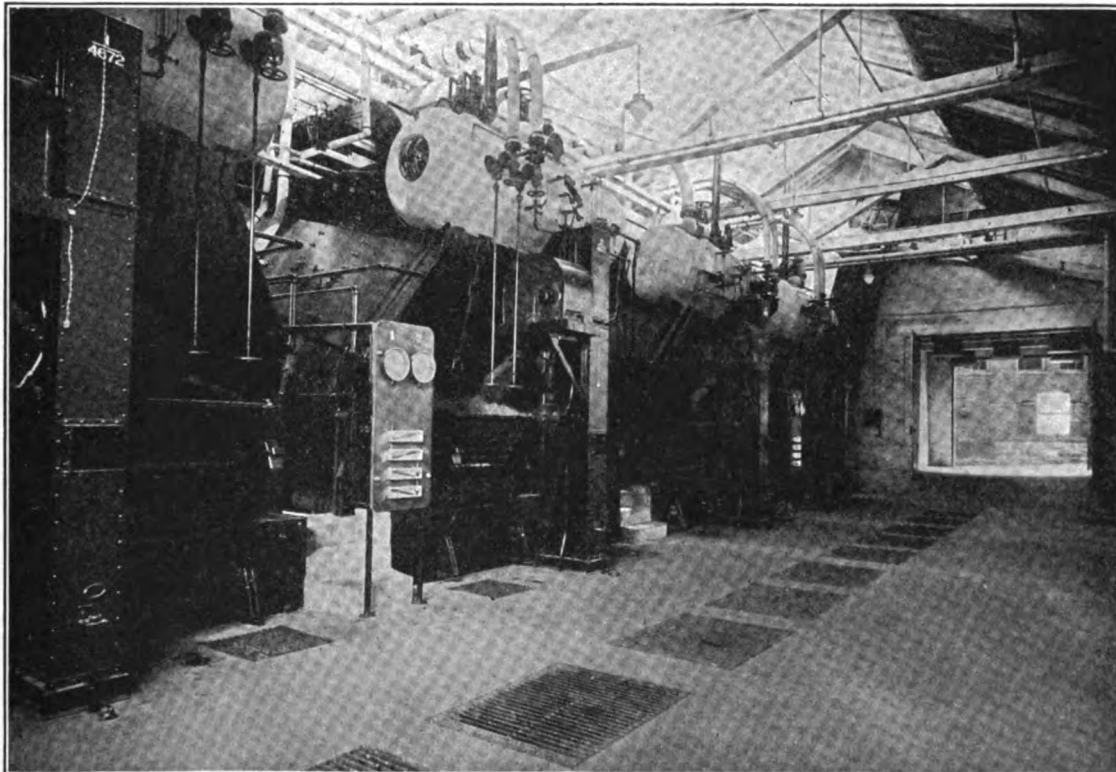
BARREL ELEVATOR

ASH ELEVATOR AND
STORAGE TANKCONVEYOR INSTALLED FOR THE UNITED STATES LIGHT & HEAT
CORPORATION, NIAGARA FALLS, N. Y.

PACKAGE ELEVATOR



CHASSIS CONVEYOR INSTALLED FOR THE CHANDLER MOTOR CAR CO., CLEVELAND, OHIO



COAL AND ASH HANDLING EQUIPMENT INSTALLED FOR THE STANDARD WALL PAPER CO., HUDSON FALLS, N. Y.

ESTABLISHED 1866

GILLIS & GEOGHEGAN

Manufacturers of G&G Telescopic Hoists

553 West Broadway
NEW YORK, N. Y.

TELEPHONE
SPRING 6140

PARTIAL LIST OF AGENCIES IN THE UNITED STATES

ALBANY, N. Y., ALBANY BUILDERS SUPPLY Co.
ATLANTA, GA., H. R. HUFFMAN
BALTIMORE, MD., EASTERN SALES Co.
BILLINGS, MONT., FRANK RICHARDSON
BIRMINGHAM, ALA., JOHN D. TURNER Co.
BUFFALO, N. Y., JONES IRON WORKS
CHARLOTTE, N. C., GENERAL MILL SUPPLY Co.
CHICAGO, ILL., KAUFMAN & BRODT
CINCINNATI, OHIO, FRANK & ERWIN
CLEVELAND, OHIO, R. L. QUEISSER Co.
COLUMBUS, OHIO, R. L. WATSON
SYRACUSE, N. Y., H. L. WATERMAN, INC.

DALLAS, TEX., R. J. DEWEES Co.
DENVER, COLO., HOWARD H. FIELDING
DES MOINES, IOWA, PRESTON DANIELS
DETROIT, MICH., KENNEDY & DAWSON
EL PASO, TEX., NEFF STILES COMPANY
HUNTINGTON, W. VA., J. J. WEILER
INDIANAPOLIS, IND., GEORGE MORING
KANSAS CITY, MO., ROBERT O. SMITH
KNOXVILLE, TENN., C. M. ALLEN Co.
LOUISVILLE, KY., R. B. TYLER Co., INC.
MEMPHIS, TENN., AKERS & COMPANY, INC.
MILWAUKEE, WIS., ED. B. GOODWIN
MINNEAPOLIS, MINN., MORGAN-GERRISH Co.

NASHVILLE, TENN., E. T. KIRKPATRICK & Co.
NEW HAVEN, CONN., WARNER-MILLER Co.
NEW ORLEANS, LA., J. T. MANN & Co.
OMAHA, NEBR., F. H. TURNEY Co.
PHILADELPHIA, PA., W. G. CULBERT
PITTSBURGH, PA., J. R. PITCAIRN
RICHMOND, VA., J. S. ARCHER
ROCHESTER, N. Y., BUILDING SPECIALTIES Co.
SALT LAKE CITY, UTAH, M. W. MIHILLS & Co.
SEATTLE, WASH., S. W. R. DALLY
ST. LOUIS, MO., CONCRETE STEEL FIREPROOFING Co.
UTICA, N. Y., AMERICAN HARD WALL PLASTER Co.

Products

Equipment for handling ashes, rubbish and other materials between floors, consisting of several models of Hoists and other articles as follows:

MODEL E HOIST electrically operated with Automatic Stop and Gravity Lowering Device.

MODEL D OVERHEAD CRANE HOIST with Electric Motor in cellar.

MODEL C HOIST with Electric Motor in cellar.

MODEL B OVERHEAD CRANE HAND POWER HOIST with Automatic Gear Shifting Brake Device and Silencer.

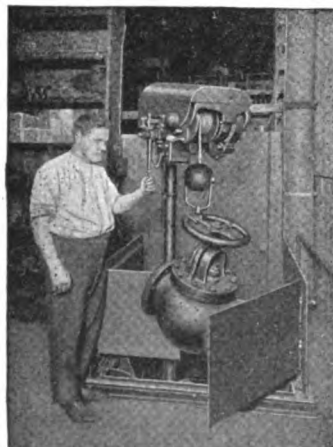
MODEL A HAND POWER HOIST with Automatic Gear Shifting Brake Device and Silencer.

Also, G&G Flush Watertight Sidewalk Doors (Checked Steel or Vault Light); G&G Automatic Sidewalk Door Opening and Closing Device; G&G Spring Guard Gates; G&G Swing Bail Ash Cans; G&G Operator's Iron Ladder; G&G Electric Warning Bell; G&G Ash Can Truck.

NOTE: It is recommended that complete G&G equipment be installed as a unit, but if desired, any part or parts thereof can be furnished separately. Above Models are made *non-telescopic* when desired.

Patents

G&G Telescopic Hoists and Hoisting Equipment are protected by U. S. A., Canadian and foreign patents. Genuine G&G Hoist Equipment bears our nameplate.



INSTALLATION OF MODEL E HOIST IN A MACHINESHOP

Raises load electrically and lowers by gravity. If operator's hand be removed from lever, load will come to an instant stop

Uses of G&G Telescopic Hoists

Designed for raising and lowering light loads (under 1000 lbs.) at industrial plants, and for removal of ashes and rubbish from all types of buildings. Especially valuable for quickly and economically raising and lowering ashes, bags, bales, barrels, baskets, boxes, cans, carboys, ice, parts of unfinished and finished machinery, rolls, rubbish, tires, trays and other loads within its scope.



Model E, Electrically Operated, Telescopic Hoist

Model E hoist raises loads of 500 lbs. to grade level at a speed of 60 ft. per minute. A specially designed Model E hoist can be had with a maximum capacity of 1000 lbs.

Hoist has a $1\frac{1}{2}$ h.p., alternating or direct current, totally enclosed motor with brake, automatic upper limit and single speed controller. Current is only consumed when hoisting. Loads lowered by gravity. Ap-

paratus is dustproof and moistureproof, lubrication being effected throughout by means of grease forced through compression cups.

A single handle controls lowering and rising operations, and, should operator's hand be removed from the lever, brake is automatically applied and load comes to an *instant stop*. Upper part of hoist telescopes below grade when not in use.

Model D, Electrically Operated, Telescopic Hoist

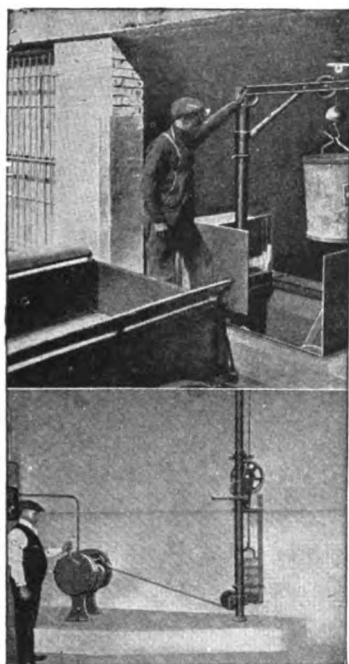
An overhead crane hoist with complete equipment for use in large buildings where grade level approach permits wagons to drive up alongside of hoistway leading to cellar or boiler room. The regular Model D hoist raises loads of 300 lbs. at a speed of 60 ft. per minute. A specially designed Model D hoist can be had with a maximum capacity of 1000 lbs.

Hoist raises load 6 or 7 ft. above grade for deposit directly into wagon without rehandling cans at grade level. For description of telescoping feature see illustration on following page.

Equipped with a $1\frac{1}{2}$ h.p. motor, totally enclosed (series wound for direct current; squirrel cage for alternating current) with magnetic service brake, mechanical load brake, automatic upper and lower carbon point limits, and single speed controller giving one hoisting and lowering speed. Cast iron base provided for motor.



ONE OF FOUR MODEL A, MANUALLY OPERATED, NON-TELESCOPIC HOISTS IN USE AT PACKARD MOTOR CAR PLANT, DETROIT, MICH.

Model C, Electrically Operated, Telescopic Hoist

MODEL C, ELECTRICALLY OPERATED TELESCOPIC HOIST IN USE AT THE 53RD STREET FREIGHT STATION, ILLINOIS CENTRAL R. R., CHICAGO
Right-hand gate removed to show door opening and closing device

allowing operator to deposit load on grade without lifting. Hoisting handle does not revolve when brake is used to lower load. This makes it possible to lower rapidly and protects operator from possible injury.

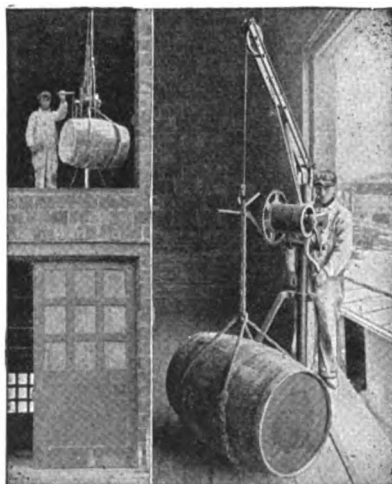
Model B, Manually Operated, Telescopic Hoist

An overhead crane hoist built to raise loads of 300 lbs. at a speed of 30 ft. per minute. A specially designed Model B hoist can be had with a maximum capacity of 1000 lbs. Both telescoping and hoisting handle act upon compound gears. Pressure exerted upon hoisting handle in raising load is only 7 lbs. for 100 lbs. of weight. As in the case of the Model A hoist, hoisting handle of Model B does not revolve when brake is used to lower load.

The overhead crane feature makes it possible for the can, or other load, to be raised from the cellar floor high enough to dump contents into truck or railroad car. The ashes, etc., are deposited in the truck or car without re-handling at grade level.

Telescopic Feature of G&G Hoists

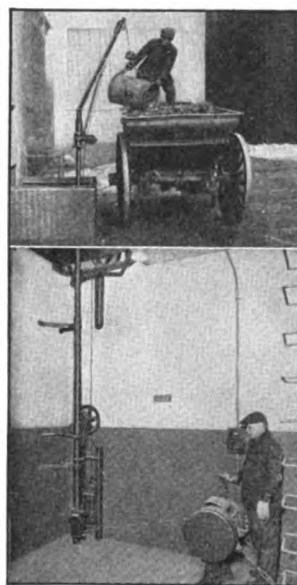
No part of hoisting apparatus shows above grade when hoist is not in use. See illustration in opposite column.



MODEL B, MANUALLY OPERATED NON-TELESCOPIC HOIST AT THE RICHES-PIVER CO. CHEMICAL PLANT AT LYONS FARMS, N. J.

Operating Economy

Test conducted by Sprague Electric Co. at Mergenthaler Linotype Co., Brooklyn, N. Y., showed that G&G Model D electric hoist handles 78 cans of ashes in 1 kw. hour. Height of lift, 21 ft. Cost of current, 3c per kw. hour. Complete details in G&G catalogue.



MODEL D, ELECTRICALLY OPERATED TELESCOPIC HOIST AT MERGENTHALER LINOTYPE CO., BROOKLYN, N. Y.

Upper part of hoist telescopes below grade when not in use

rated capacity of 1000 lbs.

Installation

All necessary clamps and bolts are furnished with each hoist, together with detailed blue print showing how to erect, and set of instructions covering operation.

G&G Literature

All factory executives, and others interested, should write for copy of our latest pamphlet "Industrial Plants Need This Hoist." For the convenience of the consulting engineer and specification writer, we have prepared specifications and detailed drawings which we will send on request.

Approved Product

The G&G Telescopic Hoist was investigated and approved March 24, 1915, and June 10, 1920, by Investigating Committee of Architects and Engineers.

Silencer

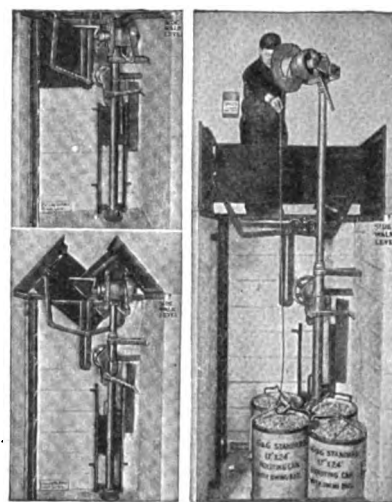
All manually operated G&G hoists are equipped with a patented "silencer" which makes them practically noiseless in operation. Lubrication is effected by a simple but efficient method.

Non-freezing Feature

G&G hoists can be used during the coldest weather as no parts are susceptible to freezing.

Factor of Safety

No part of a G&G hoist has a factor of safety less than 8, based on its maximum rated capacity shown on the nameplate. Gearing has a very high factor of safety of about 30. All parts have a factor of safety far beyond what is ordinarily considered necessary. On special orders we can arrange to build our hoists with a maximum



OPERATION OF G&G DOOR OPENING AND CLOSING DEVICE

In this case adapted to a Model A hoist but can be used with all models of G&G hoists. Operates automatically when telescoping handle is revolved. Checkered steel or vault light doors open and close and lock as hoisting head is raised or lowered. Spring guard gates, which swing outward only, automatically close up opening at grade level between open doors.

LINK-BELT COMPANY

Manufacturers of Elevating, Conveying and Power Transmission Machinery

PHILADELPHIA, PA.

CHICAGO, ILL.

INDIANAPOLIS, IND.

BRANCH OFFICES

NEW YORK, N. Y., Woolworth Building
BOSTON, MASS., 49 Federal Street
PITTSBURGH, PA., 1501 Park Building
ST. LOUIS, MO., Central National Bank Building
BUFFALO, N. Y., 547 Ellicott Square

WILKES BARRE, PA., Second National Bank Building
HUNTINGTON, W. VA., Robson-Prichard Building
CLEVELAND, OHIO, 429 Kirby Building
DETROIT, MICH., 4210 Woodward Avenue

KANSAS CITY, MO., 306 Elmhurst Building
SEATTLE, WASH., 820 First Avenue, South
PORTLAND, ORE., First and Stark Streets
SAN FRANCISCO, CAL., 168 Second Street
LOS ANGELES, CAL., 163 No. Los Angeles Street

IN CANADA: CANADIAN LINK-BELT Co., LTD., TORONTO and MONTREAL

AGENCIES

H. W. CALDWELL & SON Co., Woolworth Building, NEW YORK, N. Y.
17th and Western Avenues, CHICAGO, ILL.
709 Main Street, DALLAS, TEX.

DENVER, COLO., LINDROOTH, SHUBERT & Co., Boston Building
LOUISVILLE, KY., F. WEHLE, Starks Building
NEW ORLEANS, LA., C. O. HINZ, 504 Carondelet Building
BIRMINGHAM, ALA., S. L. MORROW, 720 Brown-Marx Building

Products

ELEVATING and CONVEYING MACHINERY for handling all kinds of materials:

- Elevators and Conveyors.
- Coal and Ash Handling Machinery.
- Locomotive Cranes.
- Electric Hoists.
- Portable Loaders.
- Belt Conveyors.
- Bucket Carriers.
- Water Intake Screens.
- Coal Storage Systems.
- Car Unloaders.
- Screw Conveyors.
- Chains, Wheels, Buckets.
- Gears, Transmission Machinery.
- Screens, Crushers, Feeders.
- Silent Chain Drives.
- Steel Roller Chains.

Elevating and Conveying Machinery

The usefulness of Link-Belt Elevating and Conveying Machinery and its adaptability to a wide range of industries is evident to any one who observes what is going on in all lines where materials are handled from one place to another. Its use benefits both employer and employee alike, under modern economic conditions.

The intensive production which characterizes the automobile industry, for instance, has been made possible by well planned conveyors and elevators. Willys-Overland, Ford and other cars are assembled on continuously moving conveyors, piece by piece being added by the assemblers at stations along the course of the conveyor. Frame after frame moves through the assembling room at a rate which allows proper time to make the various additions. Everything is planned to secure the highest efficiency mechanically, with the greatest convenience and least strain for the men. This same plan is being applied to other industries today, with the same success.

One important reason for the efficiency and popularity of modern conveying machinery for moving material in bulk (coal, stone, gravel, etc.) is the fact that the process is continuous; a steady stream of small quantities handled by the rapid succession of conveying flights or buckets, transports a large amount of material in a day, although the machinery used requires but small space and little power for operation. Loading and discharging are automatic, reducing operating expenses to a minimum.

A list of the lines of industry in which Link-Belt machinery is employed comprises practically the entire line of industrial activity, because wherever labor is used, there is a type of Link-Belt product which makes that labor more effective and more contented.

Link-Belt equipment is always built to fit the conditions. Practically every handling problem is different, requiring individual attention and study.

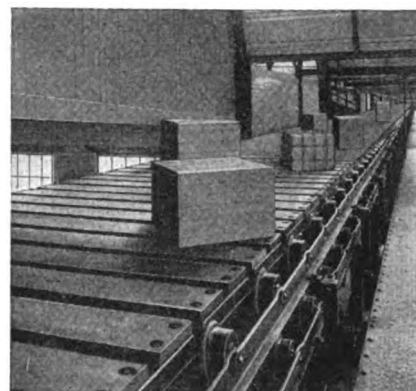
By that, however, we do not mean that there are no standard Link-Belt machines. We have many, such as our locomotive cranes, electric hoists, portable loaders, etc., which are recognized standard types of machines the country over. Such machines often form part of a larger general plan.

The question to determine is, what plan will accomplish the desired results with the greatest effectiveness and economy.

It is not practicable for us to give information in this publication which would enable you to pick out such machinery as you might feel would solve the problem. It is to your advantage, as well as to ours, to let our experienced engineers study the problems and recommend conveying equipment which will accomplish results in the most economical way. We make no charge for advice, layouts or estimates.

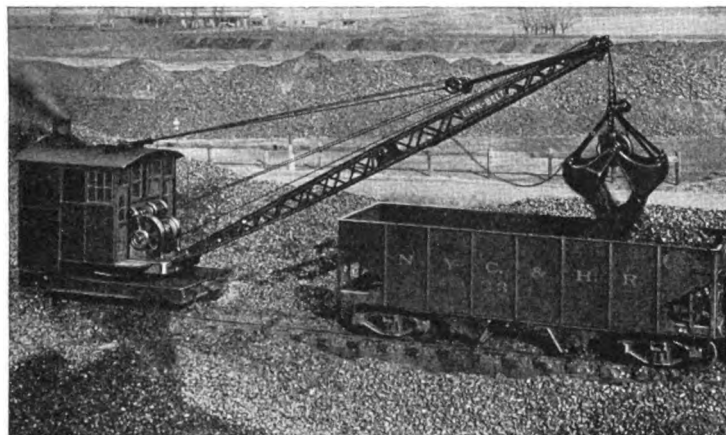
Our experienced engineers are prepared to give prompt service in the solution of elevating and conveying problems based on years of experience in this work.

Write for General Catalogue No. 300 which illustrates and describes the entire Link-Belt line, and tell us about your problems.

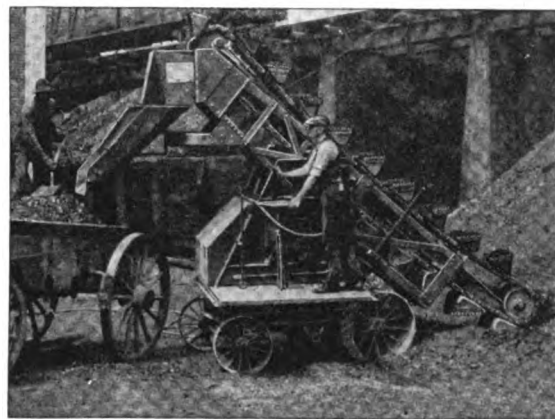


LINK-BELT ELEVATORS AND CONVEYORS

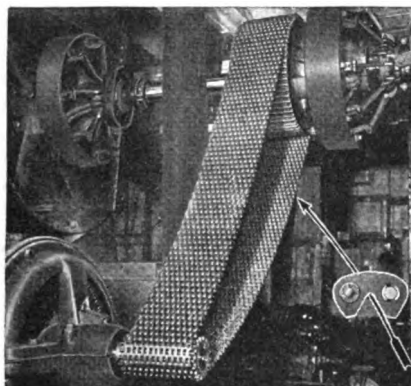
Increase production, save labor and promote general efficiency. Handle all materials. Send for Catalogue No. 375



LINK-BELT LOCOMOTIVE CRANE
Catalogue No. 370



LINK-BELT PORTABLE LOADER
Catalogue No. 357



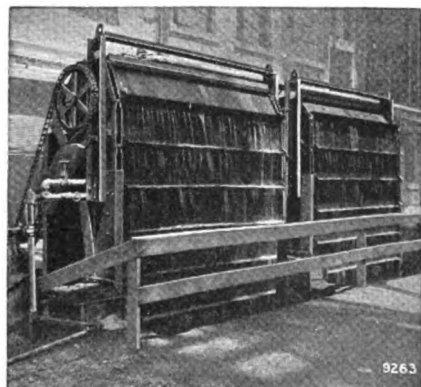
LINK-BELT SILENT CHAIN
For high speed power transmission. Catalogue No. 125



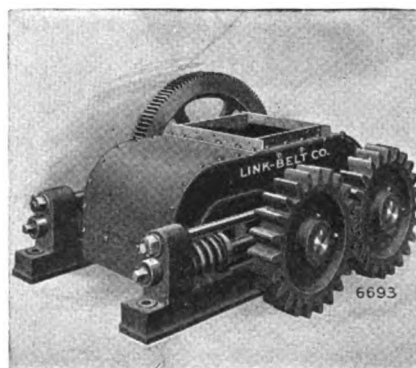
LINK-BELT ELECTRIC HOIST
Catalogue No. 380



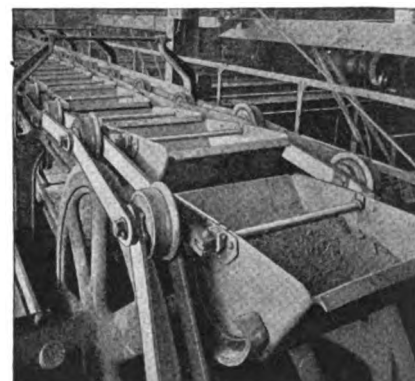
LINK-BELT BELT CONVEYOR
For handling all kinds of material. Catalogue No. 215



LINK-BELT TRAVELING WATER SCREEN
Catalogue No. 352



LINK-BELT COAL CRUSHER
For reducing coal to size required for stokers. Made in many types and sizes to meet all requirements



PECK OVERLAPPING PIVOTED BUCKET CARRIER
For handling coal and ashes, stone, gravel, etc. Catalogue No. 220

STANDARD CONVEYOR COMPANY

NORTH ST. PAUL, MINN.

BRANCH OFFICES

CHICAGO, ILL., 549 West Washington Street
MILWAUKEE, WIS., 606 Security Building

CLEVELAND, OHIO, 225 Electric Building

NEW YORK, N. Y., 227 Fulton Street
BOSTON, MASS., 113 State Street

Products

Conveying Systems and Units: GRAVITY ROLLER CONVEYORS and SPIRAL CHUTES; POWER AUTOMATIC ELEVATORS; BELT CONVEYORS; CHAIN SLAT CONVEYORS. For Pneumatic Tube Systems, see page 844.

Utility of Indoor Conveying Systems

Standard indoor transportation systems offer a practical and economical solution of almost any handling problem. They are built on the unit plan and therefore are remarkably flexible in application.

Standard conveying equipment is used extensively in the following industries: Bottling plants, creameries, canneries, packing houses, flour mills, bakeries, boot and shoe factories, automobile and machinery manufacturing and assembling plants, foundries, textile mills, paper and pulp mills, newspaper offices and publishing houses, warehouses, wholesale grocery, drug and hardware concerns, department stores, mail order houses—in fact, almost every line of industry is served by these versatile conveyors.

Construction and Operation

Gravity Roller Conveyors—Stationary or portable gravity roller conveyors are built in standard 10-ft. sections, and in special lengths when required.

The rollers are of steel tubing, maple or cast iron, and operate on substantial yet sensitive stud-type ball bearings. The bearing stud

is of the very best cold rolled shafting, around which the steel balls revolve in a ball race of case hardened steel.

Spiral Chutes—The wings of a Standard spiral chute are pressed to shape and are joined by downward bent flanges, leaving a runway free of bolts or projections of any kind. The pitch of the chute is accurately determined to give proper speed to the load. Unit construction, automatic fire doors, and intermediate diverters are outstanding features.

Slat Conveyors—Standard slat conveyors are designed to fit the requirements of each installation. The steel or hard maple slats of the moving platform are attached to roller type steel chain of size and weight suitable to the purpose of the construction.

Elevators—The straight lift elevator is continuous in operation, is automatically loaded and discharged, and has a detector device insuring safe unloading.

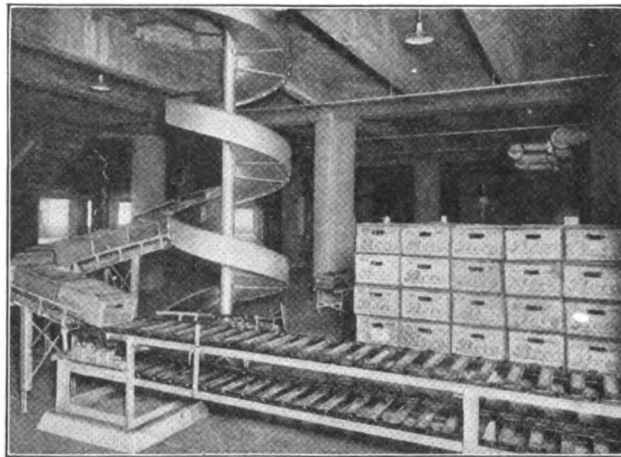
The inclined elevator automatically receives, elevates and discharges boxed and cased goods from and to connecting lines of gravity conveyor.

Belt Conveyors—The belt conveyor is constructed to eliminate all drag and reduce friction to a minimum.

Service

The company's engineers will examine your handling problem and assist in planning a practical, efficient conveying system.

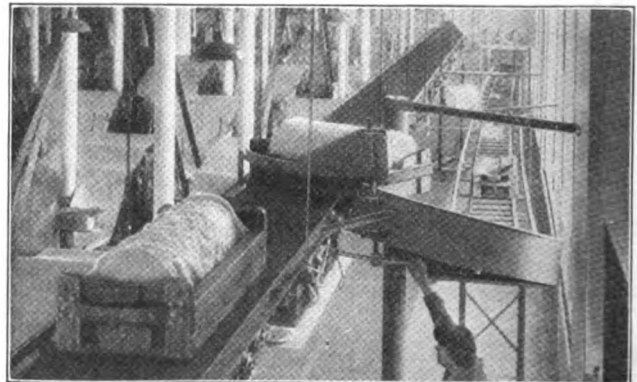
This service incurs no obligation.



STANDARD COMBINATION SYSTEM OF SPIRAL CHUTE, GRAVITY ROLLER CONVEYOR AND POWER SLAT CONVEYOR



STANDARD INCLINED ELEVATOR FOR BOXED AND CASED GOODS



STANDARD BELT CONVEYOR CARRYING LAP CRADLES IN TEXTILE MILL

THE STEARNS CONVEYOR COMPANY

Material Handling Machinery

St. Clair Avenue at East 200th Street
CLEVELAND, OHIO

Products and Services

PIVOTED BUCKET CARRIERS; BELT CONVEYORS.

Also manufacturers of Bucket Elevators, and Pan, Screw and Apron Conveyors.

We design, manufacture and install Stearns material handling equipment for every service.



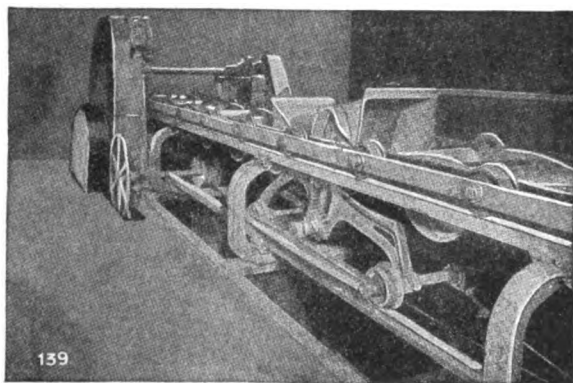
Belt Conveyors

A belt conveyor, when properly installed, makes the ideal equipment for handling materials in bulk or packages. The combination of the Stearns gradual troughing idler and the Philips patented idler pulley is the acme of belt conveyor practice.

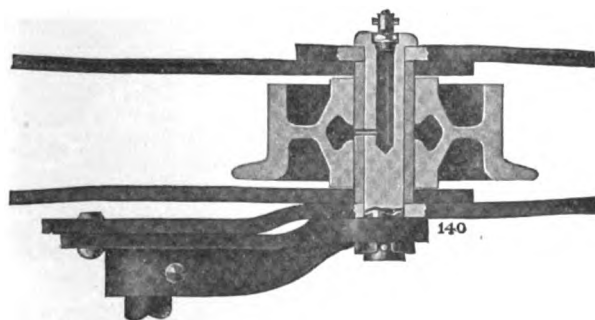
Pivoted Bucket Carriers

There are ten mechanical refinements in the Stearns carrier:

- (1) All steel chains give equal stretch to both strands.
- (2) Chain pins fitted with Alemite high pressure greasing nipples.
- (3) Rollers provided with grease chambers; no troublesome felt washers and push plugs.
- (4) Glass hard bushings and chilled tread cast iron rollers insure long service.
- (5) Continuous steel skirt plates on lower run protect the chains.
- (6) Heavy cast iron corner stands make rigid construction.
- (7) Buckets may make a complete circuit without dumping; no troublesome lap-changing cams necessary.
- (8) Malleable iron buckets with overlapping lips and chilled iron dumping cams.
- (9) Buckets are symmetrical and are easily reversed, presenting new surfaces to the trip cams.
- (10) Buckets glide over tripper with easy release; no banging of lips.



THE STEARNS CARRIER DRIVING CORNER



THE STEARNS CARRIER CHAIN JOINT

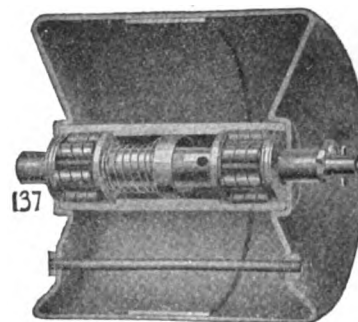


LUBRICATING A STEARNS IDLER WITH AN ALEMITE GREASE GUN

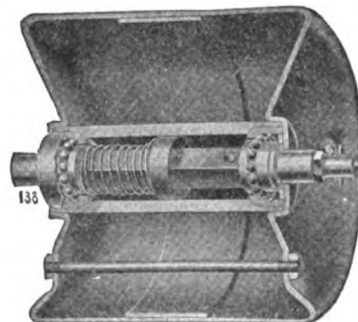
There are twelve mechanical refinements in the Stearns belt conveyor idler fitted with Philips pulleys:

- (1) All steel construction; steel pulley shells, angle iron bases.
- (2) Gradual troughing idlers, no sharp bends in the belt.
- (3) Less friction, less belt pull; Hyatt roller or ball bearings.
- (4) Easy to lubricate; use Alemite high pressure grease gun.
- (5) Grease cup, in center of pulley, fitted with spring plunger, holds six months' supply.
- (6) Grease works from center out; grit and dirt can not enter.
- (7) Bearings mounted between sleeve and shaft and can not get out of alignment.
- (8) Pulleys mounted on ridge of angle iron base; material can not build up and stop pulleys from turning.
- (9) Malleable iron pulley brackets, shockproof.
- (10) Pulleys perfectly balanced; no vibration at high speeds.
- (11) All pulleys have rounded edges and do not cut belt.
- (12) All pulley shafts supported at both ends shafts; not overhung.

Ask for Bulletin No. 100-K.



PHILIPS PATENTED PULLEY, FITTED WITH "HYATT" BEARINGS



PHILIPS PATENTED PULLEY, FITTED WITH BALL BEARINGS

STEPHENS-ADAMSON MFG. CO.

Manufacturers of Elevating, Conveying, Screening and Crushing Machinery
AURORA, ILL.

BRANCH OFFICES

NEW YORK, N. Y.
CHICAGO, ILL.

BOSTON, MASS.
PITTSBURGH, PA.

ST. LOUIS, MO.

LOS ANGELES, CAL.
CINCINNATI, OHIO
DETROIT, MICH.

PORTLAND, ORE.
SALT LAKE CITY, UTAH
HUNTINGTON, W. VA.

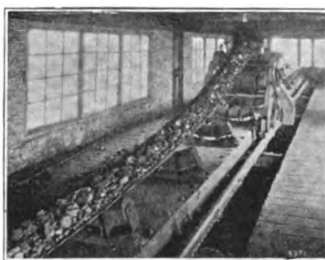
Products

BELT CONVEYORS; BUCKET ELEVATORS; SCREENS of various styles; TRANSMISSION MACHINERY; COAL CRUSHERS; SKIP HOISTS; PIVOTED BUCKET CARRIERS; UNIT BALL BEARING CONVEYOR CARRIERS.

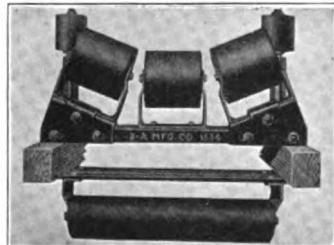
Also manufacturers of Coal and Ash Handling Equipment, Car Pullers, Glass Plant Machinery, Batch Mixers, Lehr Conveyors, Weigh Larries, Coal Tipple Machinery, Loading Booms, Picking Tables, Sand and Gravel Plants and Coal Pockets.

S-A Belt Conveyors

S-A belt conveyors are being successfully used for handling tremendous tonnages. The steady uniform capacity obtained with belt conveyors is especially desirable where large quantities must be handled quickly and economically. Upkeep and maintenance costs are small in comparison with the operation of other equipment for the same purpose.



BELT CONVEYOR



UNIT CARRIER

S-A Unit Carriers

S-A unit carriers are of all steel construction, therefore practically indestructible. They are fitted with smooth running ball bearings which save in power and belt wear. Unit carriers are mounted in a variety of styles and sizes for different conditions.

Bucket Elevators

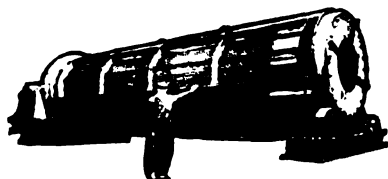
S-A Engineers specialize in the design and manufacture of bucket elevators for handling sand, gravel, stone, ore, coal and other heavy bulk materials. These elevators are furnished in various lengths to suit conditions and in capacities ranging up to 500 tons per hour. Complete equipment for elevators of the centrifugal discharge type or of the continuous bucket type may be furnished either with or without supporting frames or steel enclosure casings.



BUCKET ELEVATOR

Screening Equipment

S-A screens are designed and built in a wide variety of styles and sizes that they may be adapted to the special needs of the customer.



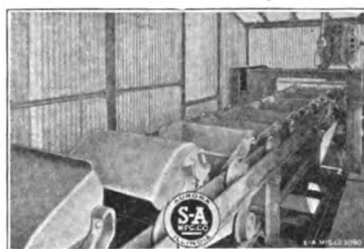
S-A REVOLVING SCREEN

quired and the capacity desired—these and other important items are given careful consideration in the framing of recommendations for a particular problem.

Reciprocating grizzlies, rocker screens, oscillating screens and other standard and special screening equipments are built for a diversified range of duty. Each S-A screen is built to give long dependable service under adverse conditions.

Pivoted Bucket Carriers

The only conveyor which will successfully handle coal and ashes is the pivoted bucket carrier. For this reason the carrier is particularly adapted to power plant uses. The S-A pivoted bucket carrier embodies certain characteristic features which enhance its value and its efficiency as a dependable unit in the boiler room.



PIVOTED BUCKET CARRIER

Skip Hoists

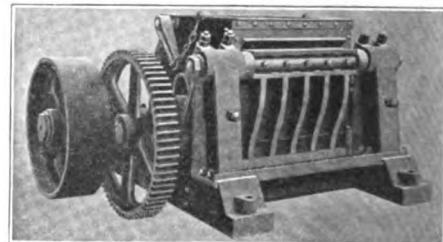
On account of the few moving parts of skip hoists they are especially adapted to the handling of ashes and other abrasive material. Equipments may be designed with two buckets, one balancing the other with a corresponding decrease in the amount of power required. The skip hoist machines are fully equipped with powerful brakes, automatically controlled, and with automatic terminal stopping mechanisms designed in various capacities to meet requirements.



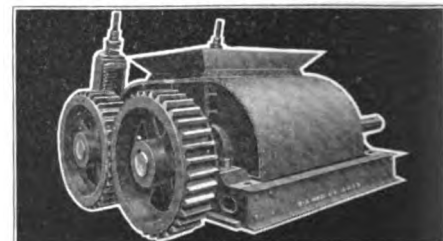
SKIP HOIST

Coal Crushers

For reducing run-of-mine coal to stoker size, S-A crushers are highly successful. The floating roll of the double roll coal crusher is fitted with the patented toggle spring release, which gives maximum pressure between the rolls when they are in their normal operating position. Because the pressure between the rolls decreases as they are separated, tramp iron and other foreign objects will not injure the crusher, as would be the case with machines of ordinary construction.



SINGLE ROLL COAL CRUSHER



DOUBLE ROLL COAL CRUSHER

WELLER MANUFACTURING COMPANY

Conveying and Power Transmitting Machinery

1820-1856 North Kostner Avenue
CHICAGO, ILL.

NEW YORK, N. Y.
CLEVELAND, OHIO

BOSTON, MASS.
CLEVELAND, OHIO

SALES OFFICES
BALTIMORE, MD.
SAN FRANCISCO, CAL.

PITTSBURGH, PA.
SALT LAKE CITY, UTAH

Products

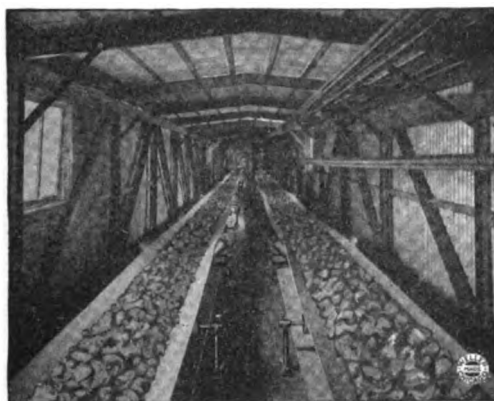
CONVEYORS of all types: Apron, Belt, Bucket, Chain, Drag, Pan and Spiral.

BUCKET ELEVATORS, ELEVATOR BUCKETS, WELLER-MADE STEEL CHAIN, CAR PULLERS, COAL CRUSHERS, RECIPROCATING and REVOLVING SCREENS.

Also Coal and Ash Handling Equipment, Weigh Larries and Track Hoppers, Apron Feeders, Heavy Sheet Metal Work, Heavy Transmission Machinery, Bar and Rotary Grizzlies, Trippers, Steel Storage Bins, Bin Gates.

Conveyors

For handling bulk or package products economically, the belt conveyor will usually give the most satisfactory service at the lowest cost per ton. This company, however, makes conveying equipment of all descriptions. Catalogues showing illustrations and layouts, and giving data that will be of service to the engineer, sent on receipt of request, stating kind of material to be handled.

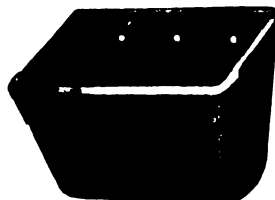


BELT CONVEYOR

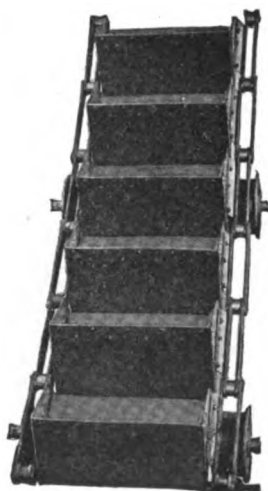
Bucket Elevators

For handling coal, stone, ore, cement, sand, grain, etc. Catalogue 35F describes all types and gives data of value to the engineer.

Elevator Buckets—Standard, heavy steel and malleable iron buckets. All styles and sizes. Write for prices.



ELEVATOR BUCKET



BUCKET ELEVATOR

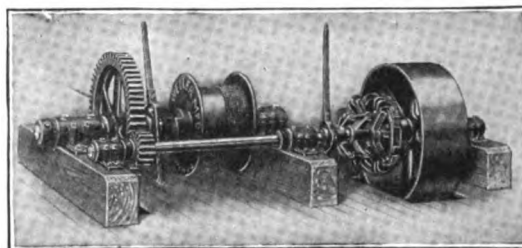


Weller - made Chain

A complete line of steel, and combination steel and malleable chain for elevating and conveying purposes. Shown in Catalogue 35B.



WELLER-MADE CHAIN

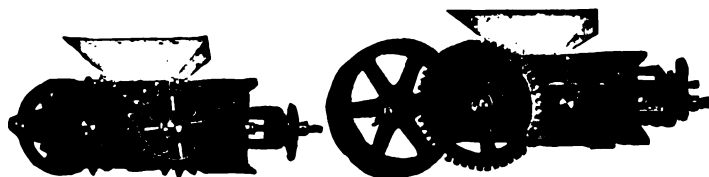


CAR PULLER

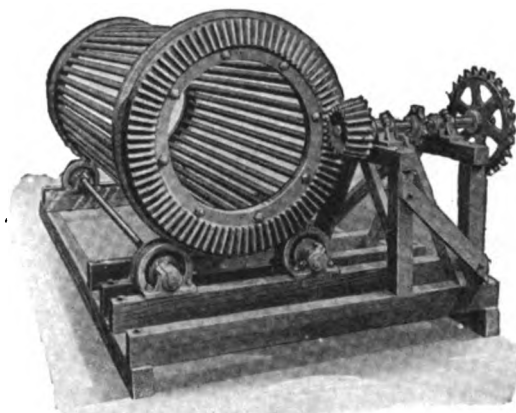
Single and double drum for wire and manila rope; capacity 2 to 18 cars
Catalogue 35K

Coal Crushers, etc.

One-, two- and four-roll for crushing coal, coke, lignite, etc. Catalogue 35F gives illustrations and descriptions of coal crushers, weigh larries, coal and stone elevators and track hoppers. This company makes a complete line of coal and ash handling equipment.



COAL CRUSHERS



• REVOLVING SCREEN

Reciprocating and revolving screens for all kinds of material. Catalogue 35H

THE GEORGE HAISS MFG. CO., INC.

Digging, Rehandling and Conveying Machinery

TELEPHONE
MOTT HAVEN 0157

Canal Place and East 141st Street
NEW YORK, N. Y.

CABLE ADDRESS
"COAL-HOIST, NEW YORK"

Products

CREEPER PATH DIGGING LOADERS, Self-propelled, Self-feeding, Self-crowding.

DIGGING WAGON LOADERS, Hand-propelled, Hand- or Self-feeding.

PATH DIGGING LOADERS, Self-propelled, Self-feeding, Self-crowding.

PORTABLE BELT CONVEYORS: Self-propelled Belt Conveyor; Self-propelled Revolving Belt Conveyor; Portable Belt Conveyors moved by hand.

Also manufacturers of Car Unloaders; Bag Loaders; Portable and Stationary Bucket Elevators.

For other Contractors' and Coal Dealers' Machinery, see page 40.

HAISS
TRADE-MARK

ers who are after maximum work at least cost for handling materials.

The patented revolving feeding propellers of these Haiss wagon loaders is a feature which has had much to do with satisfactory performance.

The blades on this device are so fixed along the lower wide spreading elevator shaft that when they revolve they force the material from both extremes of the feeding propeller shaft toward the middle point where the buckets fill up. By the same operation, the blades cut open a wide pathway to permit loader wheels to follow automatically in their wake, leaving no material to obstruct the smooth progress of the machine.

The illustrations on this page show why a bucket can not go by without taking its proper load each time.

For the contractor who feels that his work does not warrant buying the fully automatic one-man machine, the Haiss semi-automatic and digging wagon



FEEDING PROPELLERS CLEANING UP A
"PATH" AND LOADING BUCKETS
IN SAME OPERATION

Wagon Loaders

Uses—Loading and unloading trucks and cars quickly. They will dig and elevate coal, ashes, sand, gravel, crushed stone, chemicals, coke, ore, etc., and can also discharge on ground storage adjoining railroad tracks.

Advantages—For heavy going on rough roads or where the ground is yielding and for work of large volume, the "Creeper" loader (patented) is recommended, as its creeper treads enable it to operate over all character of ground and roads. For conditions not presenting such difficulties, the "Path Digging" loader (patented) will be found most desirable.

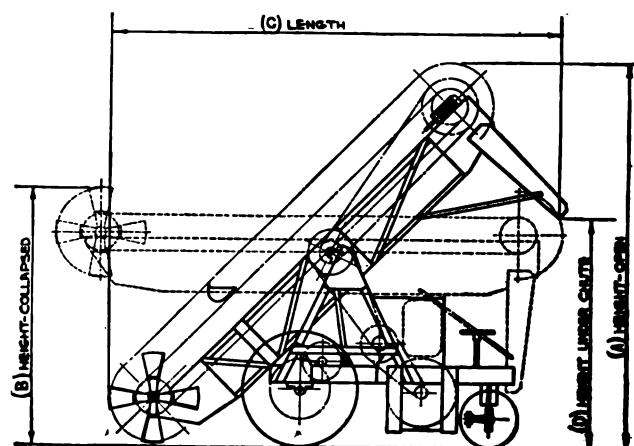
Both machines have all the automatic features which make for lower attendance labor (but one man being required for the operation of either type) and large work capacity. Either machine will load or discharge $1\frac{1}{2}$ cu. yds. of material per minute, uninterruptedly throughout the day's operation.

Both are self-propelling, self-feeding and self-crowding. The time saved in moving about from place to place quickly, under their own power, and the ability of these wagon loaders to dig in all kinds of material, appeal strongly to contractors, engineers and coal deal-



CREEPER LOADER

$1\frac{1}{2}$ cu. yds. of material in 1 minute with 1 man



DIMENSION DIAGRAM, "PATH DIGGING" WAGON LOADER

Types of wagon loaders	Creeper Loader	"Path Digging"	Hercules "Path Digging"	Super-Hercules "Path Digging"
Height A, ft.-in.	14-6	14-3	19-2	21- 8
Length C, ft.-in.	17-8½	17-8	18-1	19-10
Height of chute, D, ft.-in.	8-6	8-6	13-6	16- 0
Height collapsed, B, ft.-in.	9-0	9-0	9-3½	9- 3½
Over-all width of propellers, ft.	7	7	7	7
Electric motor, h. p.	15	10	10	10
Gasoline motor, h. p.	37	24	24	24
Weight, with electric motor, lbs.	9500	7850	8200	9100
Weight, with gas engine, lbs.	10500	8700	9600	10500

loader represents a smaller capital investment, but necessarily requires more hand labor. Nevertheless, they will show a very marked saving over hand operating.

Operation—Having been moved under its own power into a position at the foot of some material pile, the operator connects, by means of a clutch, the bucket elevator and the feeding propeller mechanism, and then, when these are in motion, he pushes into mesh a very slow traction gear, which "crowds" the entire loader at a speed of 30 in. per minute against the face of the material pile.

After the propellers undermine a pile sufficiently to cause small avalanches, the slow speed drive is thrown out, and comes into use again only when the feeding propeller blades have dug out all material within reach.

Cost of Operation—The wages of one man, and 1c or less for power, oil, depreciation and interest on each cubic yard of material dug, elevated and loaded into trucks or cars, covers the cost of operating a Haiss "Path Digging" wagon loader.

Haiss Portable Belt Conveyors

Loading and Unloading Problems—Portable belt conveyors are indispensable for rapid and cheap loading and unloading of railroad cars or trucks. They



"PATH DIGGING" WAGON LOADER HANDLING $7\frac{1}{2}$ CU. YDS. 2-IN. CRUSHED STONE IN 5 MINUTES

will deliver coal, coke, ashes, sand, gravel, crushed stone, chemicals, ore, etc., high upon ground storage piles adjoining railroad tracks. Transfer packages or loose materials to stationary conveying systems from either a single belt unit, or along several such conveyors connecting up with one another. Frequently they are employed to carry away materials automatically dug and elevated by the famous Haiss "Path Digging" wagon loader.



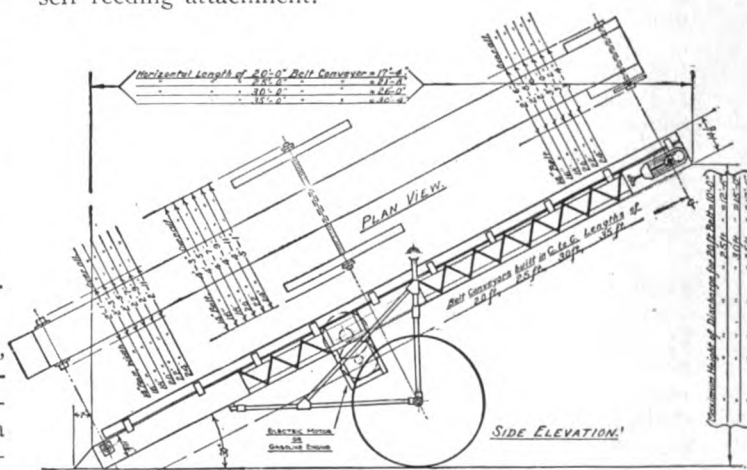
HAISS PORTABLE BELT CONVEYOR
Will handle loose material and packages with equal facility

Economy Is Only One of Their Many Advantages—Labor is reduced 75% to 90%, and quantity output is increased wherever Haiss conveyors are installed. They take the place of expensive locomotive cranes with clamshell buckets. One of these low priced, light weight conveyors, moved by a man or two, or moved by self-propelling gear, will now do this crane work immensely cheaper. Cost for power is never over a $\frac{1}{2}$ c per ton or per cu. yd. handled. Much wheelbarrow labor is also discarded. New fields for the utility of these machines have been made possible by the ingenuity of contracting engineers.

Operation—The toe of the conveyor is shoved into the pile, and then one or two men with shovels avalanche the material toward the conveyor. The machine is balanced and moved about on the wheel axle by one man.

Another type, having a 4-wheel self-propelling chassis, is equipped with a full swing turntable, permitting a conveyor to work at any point in a circle and at the same time the toe end of the belt may be lowered upon the ground or pivoted horizontally on the turntable. These conveyors are equipped with electric motors or gasoline engines; with 4-ply double sided rubber belting; fine take-up, and 4-way adjustment bearings, and many other extras that add to the notable features.

Self-feeding Attachment—Anthracite coal of domestic sizes, or other loose material not weighing over 50 lbs. per cu. ft., can be delivered on a Haiss portable conveyor belt in a steady and uniform manner by a self-feeding attachment.



DIMENSION DIAGRAM OF THE HAISS PORTABLE BELT CONVEYOR

Portability, Adaptability, Economical Operation, Low Price—These characteristics have never failed to induce active thought when discovered in a single little machine like the Haiss portable belt conveyor. Recollect for a moment that a portable crane and grab bucket riding on rails, on traction wheels or creepers, is the nearest type of equipment giving similar results. But in many places such cumbersome machines can not fit—are not adaptable, nor will their operating unit cost be on an economical basis, comparable to a Haiss belt conveyor. Then, lastly, comes the main objection—the money that heavy equipment costs, and the higher maintenance charges. Today, the portable belt conveyor is drawing a large portion of rehandling work into a special field of its own where no other machine can equal its performance for cheap and swift results.

Catalogues

Literature covering the equipment in which one is interested will be sent free on application.

CHICAGO AUTOMATIC CONVEYOR CO.

Manufacturers of Portable and Stationary Conveyors

TELEPHONE
STATE 8927

11 South LaSalle Street
CHICAGO, ILL.

BRANCH OFFICES

NEW YORK, N. Y. PHILADELPHIA, PA. PITTSBURGH, PA. CLEVELAND, OHIO DETROIT, MICH.
ST. LOUIS, MO. OMAHA, NEBR. MINNEAPOLIS, MINN. SAN FRANCISCO, CAL.
BRANTFORD, ONT., CANADIAN AUTOMATIC CONVEYOR CO., LTD.

Products

CHICAGO AUTOMATIC CONVEYORS (Patented), comprising Portable and Stationary Conveyors, drag, belt or bucket.

Chicago Automatic Conveyors

Chicago automatic conveyors handle everything such as coal, coke, sand, gravel, charcoal, scrap iron, baled scrap, sacked cement, lime, fertilizer, crushed stone, clay, salt, oxide, etc.

They can be used for operating from trolley rail where sheds are used or on portable wheel frame for loading wagons or trucks, also for unloading cars either directly into trucks or on to open storage.

We furnish conveyors to be used either portable or stationary, drag, belt or bucket type, in any length to meet the individual need. At the same time it is not necessary to make any alterations or extended preparation to install our equipment.

We make a specialty of equipping industrial plants for unloading coal into boiler room. Note photo No. 123 showing a 24-ft. conveyor unloading from drop bottom car into a 100-ft. stationary drag conveyor which distributes coal into the boiler room. Coal is unloaded from car into boiler room in one operation. Stationary conveyor is provided with slides or openings so that coal can be dropped at intermediate points when desired.

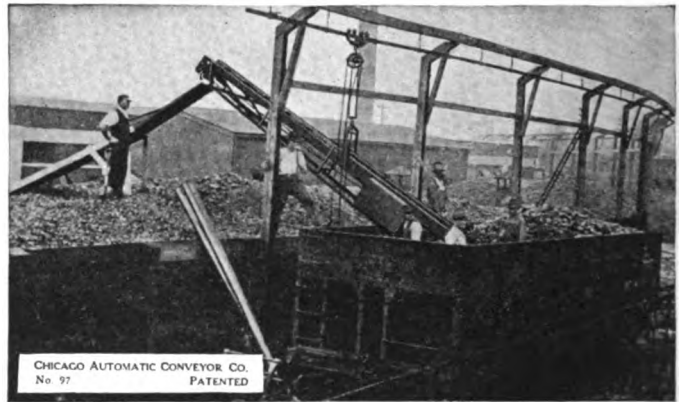
Conveyors can be operated by electric motors or gasoline engines.

The Chicago automatic conveyor, whether handled by means of a trolley rail or on a wheel frame, is complete in every detail. The motor is built into the conveyor and all the necessary attachments, such as trolley, chain hoist, plugs, receptacles, cord, chutes, trolley rail, etc., which are needed to get the proper work from such an outfit, are included.

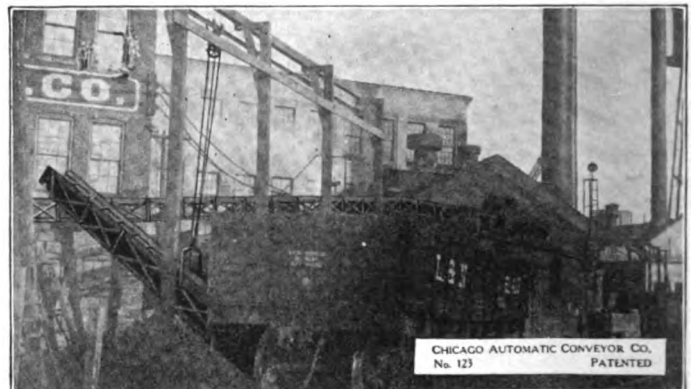
Service and Guarantee

Every outfit is installed under the supervision of our experienced erecting foremen, insuring the comple-

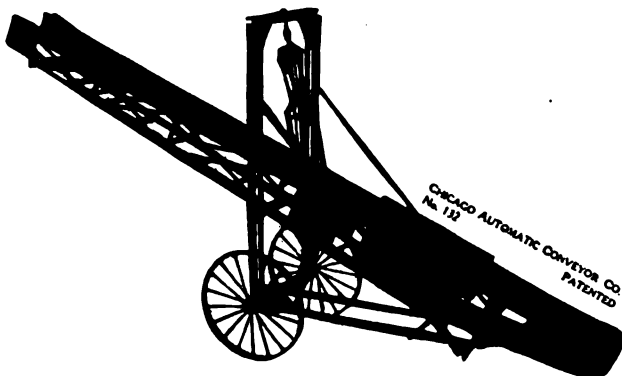
tion of the work of installation promptly, cheaply, and correctly, with no time lost on account of mistakes and experimenting, thus relieving the purchaser of all responsibility and worry.



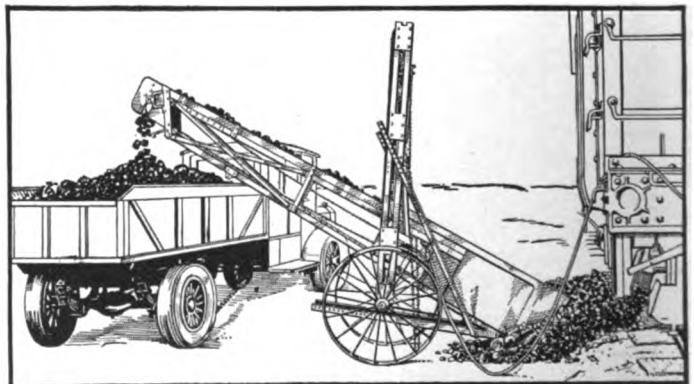
CONVEYOR WORKING FROM TROLLEY RAIL, UNLOADING COAL TO OPEN STORAGE. HIGH HOPPER CARS EASILY UNLOADED



PORTABLE CONVEYOR UNLOADING FROM DROP BOTTOM CAR INTO 100-FT. STATIONARY CONVEYOR WHICH DISTRIBUTES COAL INTO BOILER ROOM



DRAG TYPE CONVEYOR ON YOKE WHEEL FRAME WITH ELECTRIC MOTOR (MOUNTED INSIDE OF FRAME)



PORTABLE DRAG CONVEYOR UNLOADING FROM HOPPER BOTTOM CAR DIRECT INTO TRUCK

THE C. O. BARTLETT & SNOW CO.

Equipment for the Handling and Preparation of Material

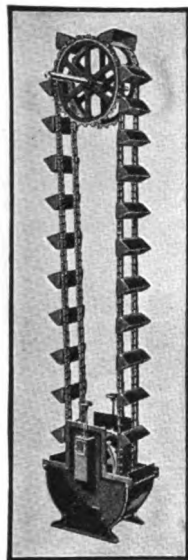
MAIN OFFICE AND WORKS
CLEVELAND, OHIO

Products

ELEVATING and CONVEYING MACHINERY; DRYERS;
SKIP HOISTS; CRUSHERS.

Also manufacturers of Pulverizers, Feeders, Screens, Mixers, Sintering Plants, Oil and Grease Extraction Equipment, Garbage Reduction Plants, Paint Making Machinery, Car Hauls, Special Cars.

Elevating and Conveying Machinery

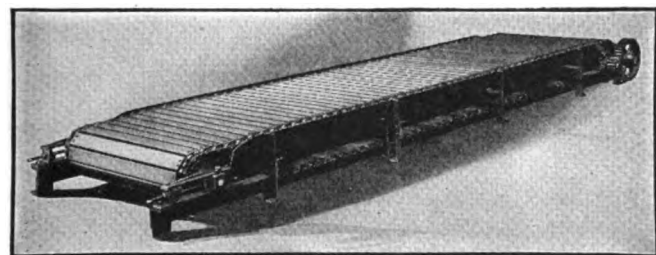


BUCKET ELEVATOR

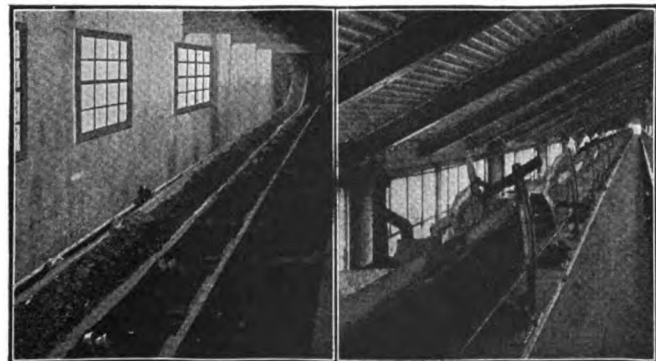
Organized in 1884, Bartlett and Snow have been building conveying and elevating equipment for thirty-eight years.

During this time, a great deal of knowledge and experience has been accumulated which is built into the equipment and which forms the basis of every suggestion offered by Bartlett and Snow engineers.

Co-operation is the essential work of the men in this organization. They will be glad to have your requirements put up to them, and will take pleasure in investigating the conditions thoroughly and offering specific suggestions which are backed up by their many years of experience.



WOOD APRON CONVEYOR FOR BOXES, PACKAGES, CASTINGS, ETC.



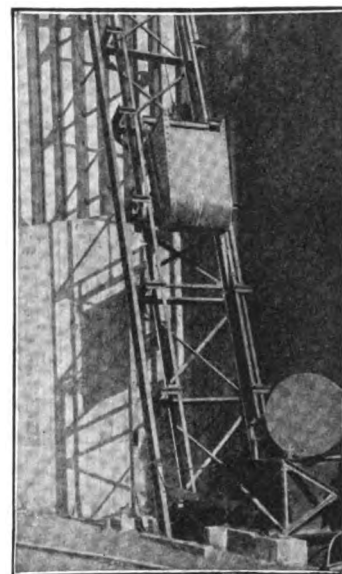
BELT CONVEYOR CARRYING
COAL

BELT CONVEYOR CARRYING
SAND

Skip Hoists

When conditions are severe and bucket elevators may be subject to excessive wear and to breakdowns, or when lifts are high or capacities large, skip hoists will prove remarkably economical and dependable because of their ruggedness, simplicity and low cost of operation.

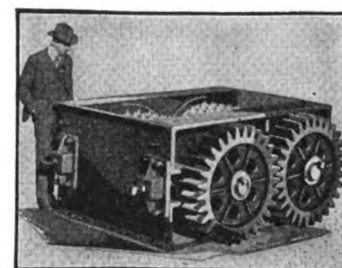
Power plants, steel mills, chemical plants, mines and sintering plants can use Bartlett and Snow skip hoists for lifting coal, coke, ashes, limestone, flue dust, slag, ores and other gritty material.



SKIP HOIST CARRYING ASHES

Coal Crushers

Bartlett and Snow coal crushers include single-roll, two-roll and four-roll crushers in various styles and sizes for different conditions and capacities. All three types are described in Catalogue 42.

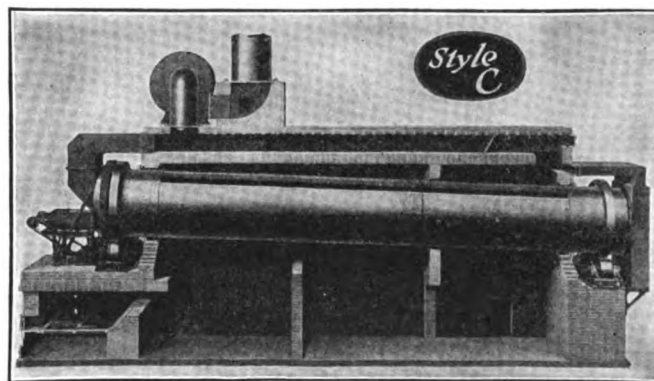


TWO-ROLL COAL CRUSHER

Mechanical Dryers

Bartlett and Snow dryers comprise thirteen different types, each one of which has been developed for drying a certain class of materials.

If you will tell us the hourly tonnage and the amount of moisture in the material, we will be glad to tell you which dryer will do your work best.



ONE OF THIRTEEN DIFFERENT TYPES OF BARTLETT AND SNOW
DRYERS

R. H. BEAUMONT CO.

Coal, Coke, and Ash Handling Systems

370 Arch Street
PHILADELPHIA, PA.

BRANCH OFFICES AND REPRESENTATIVES

CHICAGO, ILL., 1406 South Michigan Avenue
BOSTON, MASS., 261 Franklin Street
GREENVILLE, S. C., Masonic Temple Building

NEW YORK, N. Y., 50 Church Street
PITTSBURGH, PA., 1503 Oliver Building
DENVER, COLO., 538 United States National Bank Building
MINNEAPOLIS, MINN., 501 South 6th Street

Products

BEAUMONT SKIP HOIST for coal, coke and ashes.

BEAUMONT COAL WEIGH LARRY for boilers.

BEAUMONT CABLE DRAG SCRAPER for coal storage.

BEAUMONT SUPER-CENTRAL SYSTEM for handling coal and ashes.

Also Conveyors, Coal Crushers, Steel and Concrete Bunkers and Structures.

Beaumont Skip Hoist

For handling coal and ashes at the boiler house, this device affords the highest efficiencies at least cost for installation and operation. Consists of a bucket running on inclined or vertical tracks, hoisted by means of a steel cable attached to a winding machine. Bucket consists merely of a rectangular steel box, open at the top and fitted with guide rollers and hoist bale. Winding machine is driven by electric motor.

In the coal skip the bucket is started upward by pushing a starting button. It discharges and returns automatically to the pit where it is reloaded by the Simplex automatic loader and again ascends, reciprocating up and down until all coal is elevated. Capacities

Beaumont
ONE CONTRACT
ONE RESPONSIBILITY

TRADE-MARK

of Beaumont skip hoists range from 6 to 300 tons of coal per hour at 100 ft. lift.

In the ash skip the bucket is started upward by pushing a button. It discharges and returns automatically to the pit where it stops, ready for another load. Large ash skips are arranged with the Simplex loader for continuous operation.

The Beaumont skip hoist has the following advantages:

- (1) Simplicity; only bucket, cable and winding machine move.
- (2) High capacity; up to 300 tons per hour, 100-ft. lift.
- (3) Low installation and operating costs.
- (4) Low power consumption.
- (5) High lift is no objection to the skip hoist.
- (6) Operates with minimum noise.

Send for Catalogue 50 containing full details.

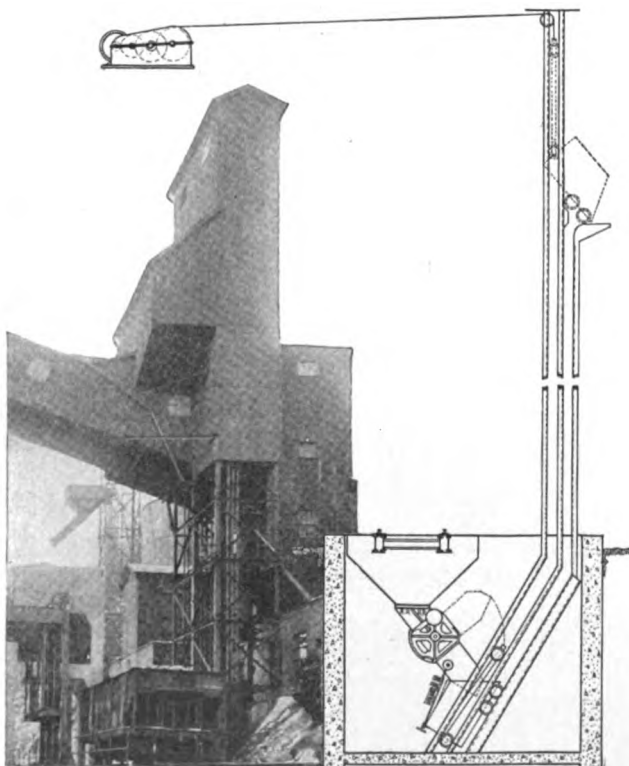
Beaumont Coal Weigh Larry for Boilers

A plate steel hopper suspended on scales. Coal is drawn from bunker into larry, weighed, recorded, and fed to stokers as needed. No expensive hopper-bottom bunkers and chutes are needed. Coal is stored in a low cost external bunker at end of firing aisle. Gates on bunker can be spaced very closely, leaving minimum of dead coal.

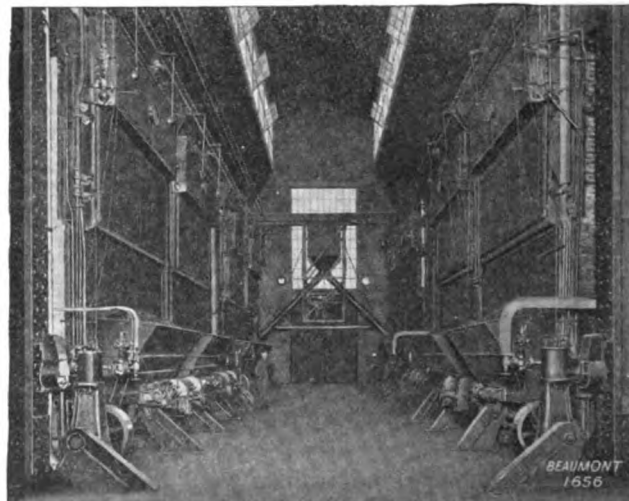
Firing aisle is left free of all obstructions, facilitating boiler cleaning, replacement of tubes, etc.

Beaumont Weigh Larries are made in hand operated and motor driven types, with capacities from 1000 lbs. to 25 tons.

Catalogue B-46 contains full descriptions of both types.



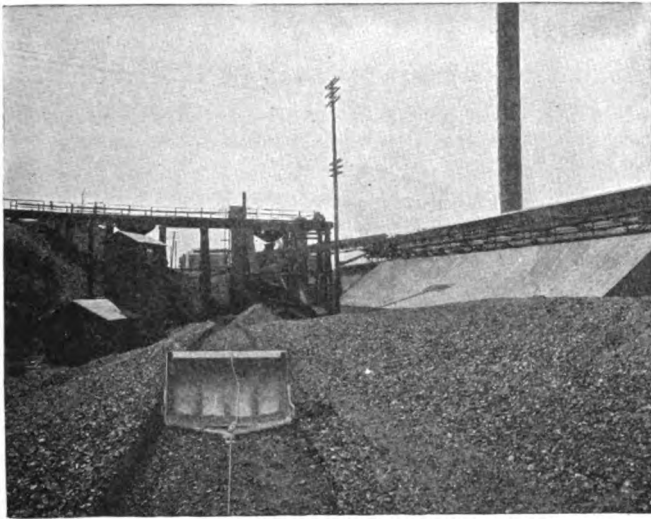
TYPICAL INSTALLATION AND DIAGRAM OF OPERATION OF
BEAUMONT SKIP HOIST



BEAUMONT WEIGH LARRY IN THE PLANT OF THE STUDEBAKER
CORPORATION, SOUTH BEND, IND.

Beaumont Cable Drag Scraper for Coal Storage

A simple, economical means of storing reserve fuel on any piece of ground adjacent to railroad track, and reclaiming it with same equipment. An electrically driven winding machine and cable, steel posts, and the



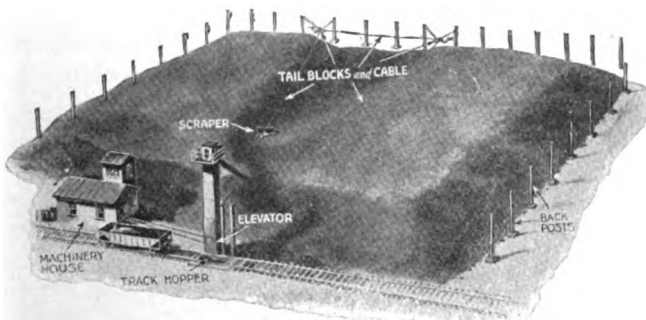
BEAUMONT CABLE DRAG SCRAPER AT MUNICIPAL ELECTRIC LIGHT & POWER PLANT, RICHMOND, IND.

steel scraper which stores and reclaims the coal, comprise the entire system.

Coal is discharged from railroad cars into hopper below tracks. A skip hoist or chain and bucket elevator picks up coal and delivers it down chute to form initial pile.

A machinery house contains the driving drums, to which are attached the ends of a steel cable extending over storage area and attached to the scraper. Scraper is dragged back and forth over coal, and is easily detachable so that it can be turned around for reclaiming. To store or reclaim coal at any part of storage area, tail blocks are moved on steel posts at boundary of yard.

System is made in nine sizes with capacities ranging from 40 to 600 tons of coal per hour on an average



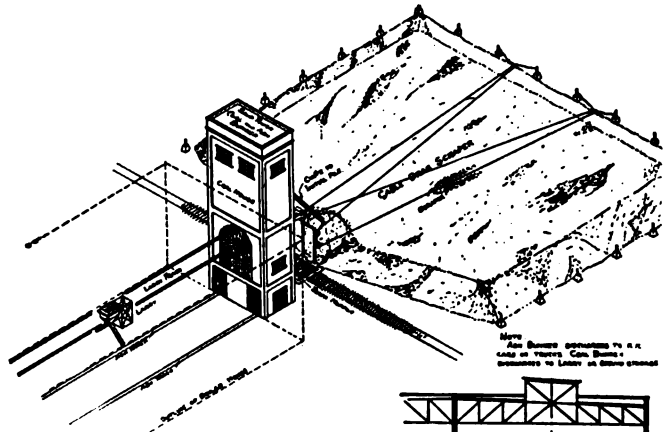
TYPICAL ARRANGEMENT OF BEAUMONT CABLE DRAG SCRAPER SYSTEM

100-ft. haul. Labor costs average less than 1¢ per ton, one man operating entire system.

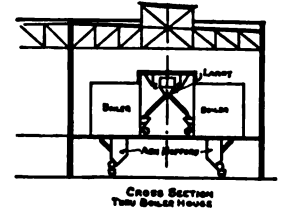
Complete details are contained in Catalogue 45.

Super-central System for Handling Coal and Ashes

System consists of a Beaumont Skip Hoist, a Beaumont Coal Weigh Larry, a Beaumont Cable Drag Scraper, and two bunkers, one for coal and one for ashes—all the necessary equipment for the entire operation of



ARRANGEMENT AND OPERATION OF BEAUMONT SUPER-CENTRAL SYSTEM FOR HANDLING COAL AND ASHES



coal and ash handling. A separate external structure houses the bunkers and the two simple, compact winding machines that operate the skip hoist and the drag scraper. System is applicable to any kind or size of boiler house.

Coal is elevated from track hopper to bunker by skip hoist, thence delivered to weigh larry for feeding to stokers or chuted to ground to be stored and later reclaimed by drag scraper.

Ashes are collected from under boilers in small hand or electric propelled cars, raised by skip hoist to ash bunker, and from there chuted into railroad cars or motor trucks.

Construction, maintenance, and operating costs are extremely low. Firing aisles are kept light and clear of obstructions—there is no internal bunker. No expensive trestle work or distributing conveyors are required.

Detailed description in Catalogue 50.

Service

The R. H. BEAUMONT COMPANY specializes exclusively in coal and ash handling systems for boiler houses. Our experience is at your disposal if you plan to build a new boiler house or install coal and ash handling equipment in an existing plant.

Literature describing any or all Beaumont products will be promptly forwarded on request.

THE JEFFREY MANUFACTURING COMPANY

Elevating, Conveying and Crushing Machinery

966-99 North Fourth Street

COLUMBUS, OHIO

Products

PIVOTED BUCKET CARRIERS; CRUSHERS; SWING HAMMER PULVERIZERS and SHREDDERS; PORTABLE BUCKET LOADERS; PORTABLE CAR UNLOADERS; ELECTRIC TROLLEY and STORAGE BATTERY LOCOMOTIVES; ELEVATORS; CONVEYORS: Belt, Pan, Bucket, Scraper and Apron types.

Jeffrey Pivoted Bucket Carriers

(1) Double bushings in chains—glass hard and tough.

(2) Steel cross rods—connect carrier chains at the bucket lips; do not obstruct bucket opening.

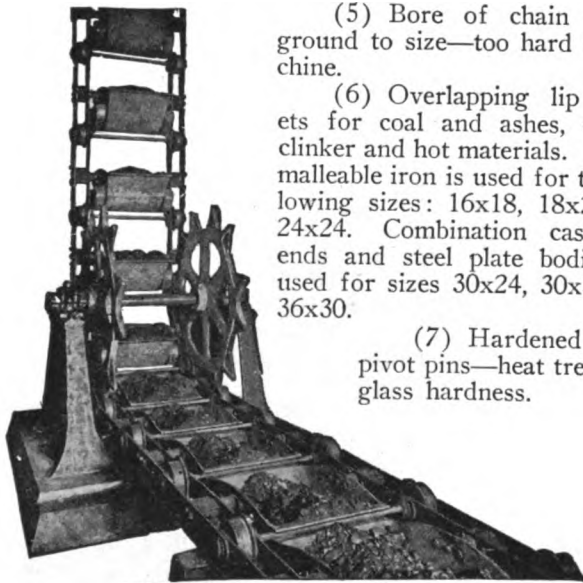
(3) High carbon steel side bars—shockproof.

(4) Large roller in chains—hard and tough on the tread and in the bore.

(5) Bore of chain rollers ground to size—too hard to machine.

(6) Overlapping lip buckets for coal and ashes, cement clinker and hot materials. Tough malleable iron is used for the following sizes: 16x18, 18x24 and 24x24. Combination cast iron ends and steel plate bodies are used for sizes 30x24, 30x30 and 36x30.

(7) Hardened steel pivot pins—heat treated to glass hardness.



JEFFREY IMPROVED BUCKET CARRIER
STANDARD SIZES

Buckets		Chains		Carrying capacity for coal in tons per hour at 50 f. p. m.
Width, in.	Length, in.	Pitch, in.	Diam. rollers, in.	
16	18	18	5	30
18	24	24	6	50
24	24	24	6	70
30	24	24	6	85
30	30	30	7	130
36	30	30	7	160

(8) Pivot blocks in chains—of hard white iron.
(9) Tripping cams on buckets—glass hard and hot riveted to bucket ends.

(10) Traveling and stationary trippers—deep chilled wearing surfaces; easy to operate.

(11) Bucket acme of efficient design—every edge and corner reinforced for long service.

(12) Absolute reliability under all conditions of service. Loaded buckets can not be carried around to filling point without first being dumped. Conveyor safeguarded throughout its entire course against improper action.

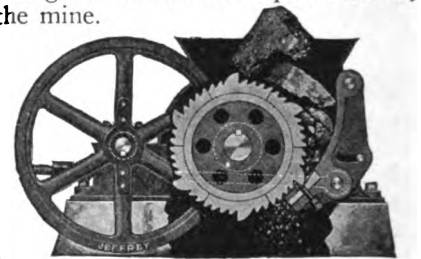
Write for Pivoted Bucket Catalogue No. 210-F.

Single Roll Crusher

This machine is designed for use at the powerhouse, coaling station, and the mine.

It reduces large lump and run-of-mine coal to stoker size in a single operation.

For run-of-mine or hard lump coal this company recommends using the 30 x30-in. size as it



JEFFREY SINGLE ROLL CRUSHER
(Patented)

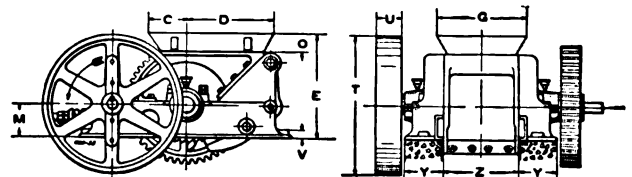
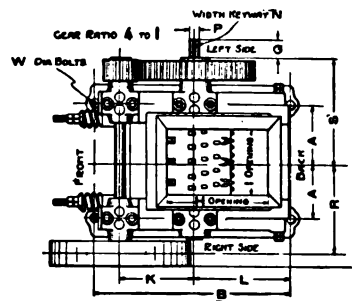


DIAGRAM JEFFREY SINGLE ROLL CRUSHER

JEFFREY SINGLE ROLL CRUSHERS

Size crusher, in.	Average Rating*			General dimensions (in inches) for belt drive																							
	Tons per hour	Approx. h. p.	Pulley, normal speed r.p.m.	A	B	C	D	E	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	Y	Z
18x18	35	15	300	14½	47	9½	20½	25	22	24	16	26½	17½	23	8	1½x½	4½	2½	4½	23½	25½	34	6½	2	1	9½	19
24x24	75	25	240	17½	55½	12½	23½	32½	30	27½	22	33	21	26	10½	1½x½	6	2½	4½	28½	30½	42	8½	2½	1½	11	25
30x30	150	50	200	22½	65	14	27	37	36	32½	28	39½	25½	30½	12	1½x½	6	3½	4½	35½	36½	48	10½	3	1½	13½	31
36x36	300	100	160	27½	76	16½	31½	44½	43½	40	35½	52½	30½	37	15	1½x1	6	3½	5½	44½	45	60	15½	3½	2	17½	37
36x54	450	150	160	37½	84	15½	27½	47	59	38	51	68	34	38	17	1x1½	6	3½	8	58½	58½	66	19	4	2	20	55

*For medium hard bituminous coal for stoker sizes.

has proved the best suited for maximum lumps. (See table at foot of the preceding page for sizes.)

Receives coal in any volume direct from a track hopper, grab bucket or mine car without the use of any mechanical device for regulating the feed. Feeder is often used simply to limit the crusher output to the smaller capacity of a receiving conveyor beneath the crusher.

It can be started up under full load and can not be flooded or choked down.

Easily adjusted and has large range for size and capacity. Consumes but little power. Costs little to install.

Occupies small space in proportion to its capacity.

All joints are machined. Gears are of steel with cut teeth.

Provided with an efficient safety device which protects against shock and accidents. Send for bulletin.

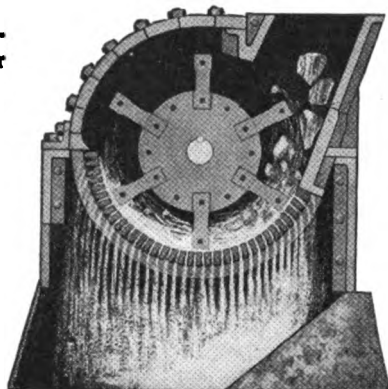
The long teeth do not interfere with the adjusting of the breakerplate up close to the roll when a fine product is required, slots being provided in the breakerplate through which they pass freely and still prevent large pieces of coal getting through without being crushed.

Write for Crusher Catalogue No. 359-C.

Jeffrey Swing Hammer Pulverizer and Shredders

Of various types and sizes for reducing large quantities of granular and fibrous materials. Complete details on application.

Write for Catalogues No. 147-N and No. 259-I.

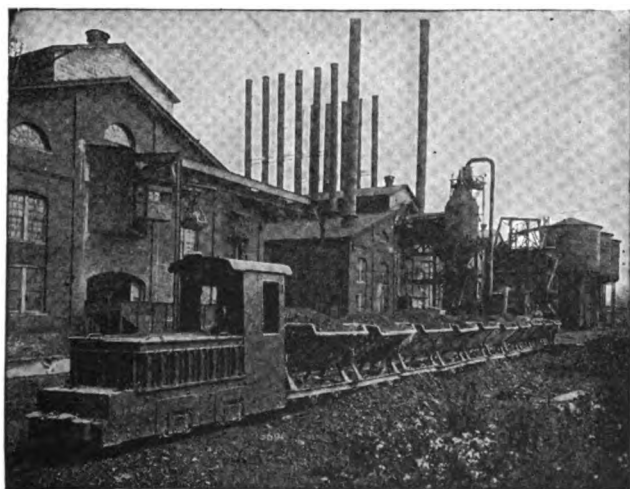


JEFFREY SWING HAMMER PULVERIZER

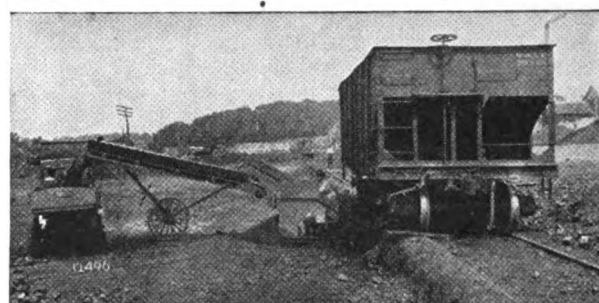
Locomotives

Storage battery locomotives are used extensively in industrial plants and mines. Trolley type locomotives are also built.

Catalogues 231-N and 263-M.



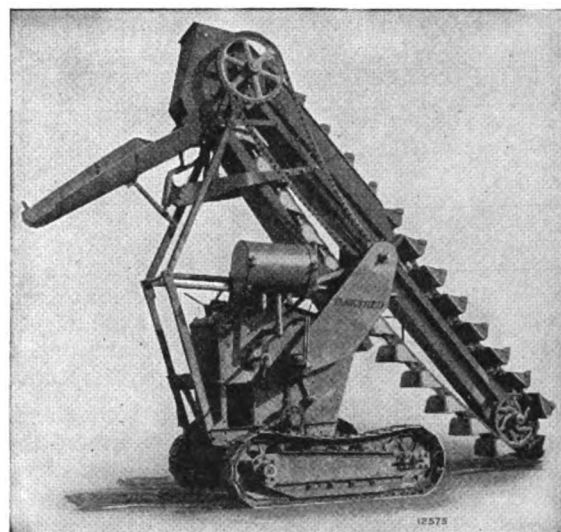
JEFFREY STORAGE BATTERY LOCOMOTIVE



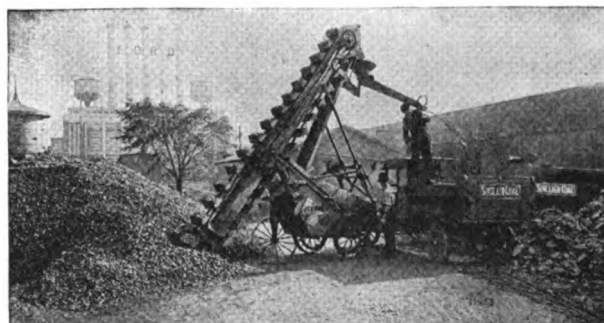
JEFFREY PORTABLE CAR UNLOADER
For handling coal from hopper bottom cars. Catalogue No. 360-B



JEFFREY PORTABLE BELT CONVEYOR
Light and inexpensive; meets the requirements of the small contractor, coal dealer or manufacturer



JEFFREY TANKTRED LOADER
For handling crushed stone, sand, gravel, coal, etc. Digs itself into pile under its own power.
Capacity, 1½ to 2 cu. yds. per minute

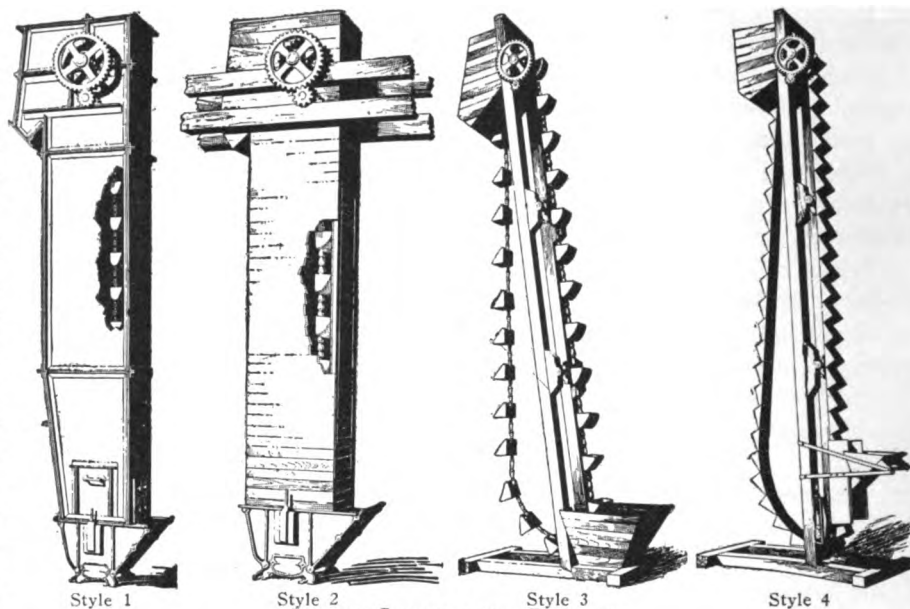


JEFFREY RADIAL TYPE PORTABLE BUCKET LOADER
For handling coal, sand, gravel, etc. Two sizes: Type "K" and type "G." Catalogues No. 288-B and 309-E

Standardized Elevators

Years of close personal contact with the industrial field in the building of conveying and elevating equipments have made it possible to select 50 elevators out of numerous styles for the handling of a wide range of materials—these being known as Jeffrey standard elevators.

Jeffrey standard elevators are made vertical or upon an incline and can be furnished with or without steel casings. Capacities range from $6\frac{1}{2}$ to 80 tons of material per hour with vertical lifts of from 10 to 75 ft. The nature of the materials handled may vary from non- or semi-gritty materials, such as grains and coal, to gritty substances, such as ashes, coke, sand, gravel and stone. The size of the material may vary from dust to $4\frac{1}{2}$ -in. cubes. These elevators consist of



JEFFREY STANDARDIZED ELEVATORS
CAPACITIES AND HORSEPOWER OF JEFFREY STANDARDIZED ELEVATORS

	Capacity, tons per hour	Maximum size of pieces, in.	0-40-ft. Centers				41-80-ft. Centers				Style
			Elevator No.	Chain No.	Size of bucket, in.	Horse- power	Elevator No.	Chain No.	Size of bucket, in.	Horse- power	
Coal, or similar material, weighing approximately 50 lbs. per cu. ft. Centrifugal Discharge Type.....	6.5	2.5	103	88J	6 x 4	.55	132	88J	6 x 4	1.1	1
			1103	88J	6 x 4	.55	1132	88J	6 x 4	1.1	2
	12.2	3	108	82R	8 x 5	1.3	137	82R	8 x 5	2.5	1
			1108	82R	8 x 5	1.3	1137	82R	8 x 5	2.5	2
	23.2	4	115	82R	12 x 7	2.2	144	82R	12 x 7	4.2	1
			1115	82R	12 x 7	2.2	1144	82R	12 x 7	4.2	2
	25	4	119	110H	14 x 7	2.5	149	110H	14 x 7	4.8	1
			1119	110H	14 x 7	2.5	1149	110H	14 x 7	4.8	2
	36	4.5	122	110H	16 x 8	3.3	152	110H	16 x 8	6.6	1
			1122	110H	16 x 8	3.3	1152	110H	16 x 8	6.6	2
Ashes, 40 lbs. per cu. ft. Centrifugal Discharge Type.....	14.4	4	166	110H	12 x 7-A	2.0	179	111H	12 x 7-A	3.6	1
	24	4	169	110H	14 x 7-A	2.5	182	111H	14 x 7-A	4.8	1
Stone, 100 lbs. per cu. ft. Centrifugal Discharge Type.....	24.5	3	208	82R	8 x 5	2.1	233	82R	8 x 5	4.1	2
			1208	82R	8 x 5	2.1	1233	82R	8 x 5	4.1	3
			216	110H	12 x 7-A	3.2	241	110H	12 x 7-A	6.2	2
	36	4	1216	110H	12 x 7-A	3.2	1241	110H	12 x 7-A	6.2	3
			220	110H	14 x 7-A	4.8	245	111H	14 x 7-A	9.4	2
	60	4	1220	110H	14 x 7-A	4.8	1245	111H	14 x 7-A	9.4	3
Stone, Continuous Bucket Type.....			0-30-ft. Centers.				31-60-ft. Centers				
	39	3.5	258	82R	12 x 6	2.6	283	110H	12 x 6	5.2	4
	80	4.5	266	110H	14 x 8	5.0	290	111SP-H	14 x 8	9.3	4

endless chains provided with buckets of steel or malleable iron, spaced at short intervals or close together, designated in the table accompanying as centrifugal discharge types and continuous bucket type, respectively.

Delivery—These elevators are made from standard specifications; by specifying same much shorter delivery may be obtained than is the case with special elevator requiring layouts and complete shop details.

Prices—The home office or any one of the branches is in a position to furnish immediate prices on any of these standard elevators. Just state the number of the elevator and the distance from center of head shaft to center of foot shaft.

Catalogue No. 244-D.

Belt Conveyors

A belt conveyor, where properly installed and operated, forms one of the most flexible and economical types of mechanical handling devices.

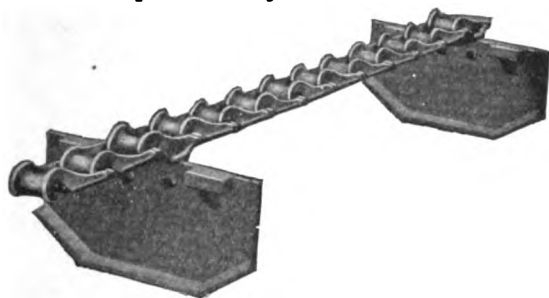
The range of materials which the belt conveyor will handle satisfactorily includes nearly all bulk materials, from the lightest of grains to the heaviest of ores, as well as packages of all kinds. It is well adapted to carry fragile materials without undue breakage. The space occupied by the belt conveyor is small and power consumption and cost of upkeep are low, making it an ideal conveyor covering a very wide range of application.

Jeffrey belt conveyors are so standardized that selection of the proper conveyor is simple. They have a range of 36 to 1724 tons per hour on any length up to 600 ft.

Catalogue No. 175-R.

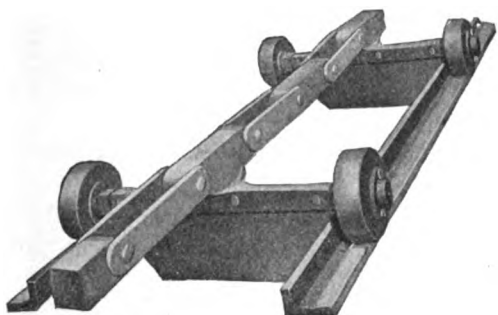


JEFFREY STANDARD BELT CONVEYOR

Standard Scraper Conveyors

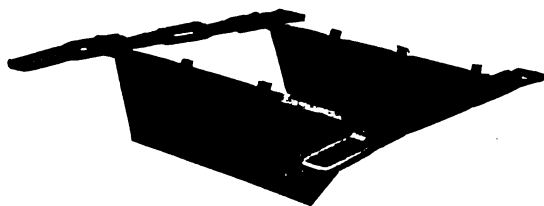
No. 1 TYPE SCRAPER CONVEYOR

The smallest standard conveyor of No. 1 type has plain cast iron scrapers 10x5 in. for handling material 3 in. and under, with a maximum capacity of 42 tons of coal per hour and a maximum length of 150 ft. Four other standard conveyors of this No. 1 type are offered for material up to 5-in. diameter with a maximum capacity of 63 tons of coal per hour and up to 150 ft.



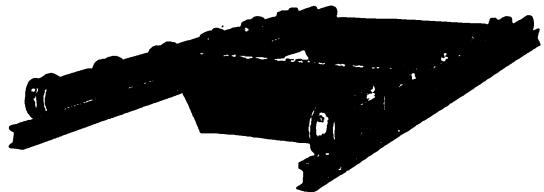
No. 2 TYPE SCRAPER CONVEYOR

Standard conveyors of No. 2 type are similar to No. 1 type except the scrapers are larger, made of steel, and are equipped with rollers and heavier chains. Capacity of 48 tons per hour for 3½-in. coal up to 70 tons per hour maximum coal of 5 in. and are made up to 200-ft. centers. Similar type is made with wearing blocks instead of rollers.



No. 3 TYPE SCRAPER CONVEYOR

Double strand plain chain steel standard conveyors of No. 3 type come in four sizes to handle maximum size coal of 9, 12, 14 and 16 in. with capacities of 60, 92, 167, 241 tons per hour respectively, and in lengths up to 200 ft.



No. 4 TYPE SCRAPER CONVEYOR

No. 4 type is made in the same general sizes as the double strand No. 3 type, and in most respects is the same, except the various styles of chain are provided with rollers to reduce friction.

Catalogue 257-A.

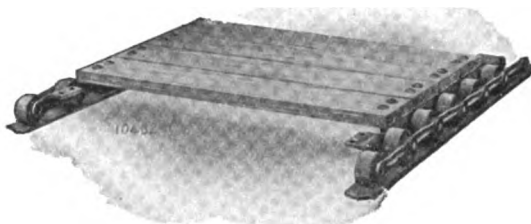
Standard Apron Conveyors

Standard wood apron conveyors handle large bulk materials, such as packages, bags, boxes, kegs, barrels, etc.



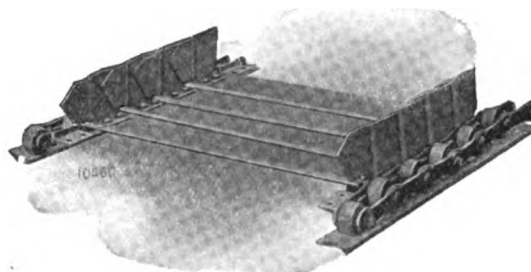
No. 1 TYPE APRON CONVEYOR

Type No. 1 conveyors are made up with detachable chains and intended for handling packages up to 100 lbs. and for a distance not in excess of 200 ft.



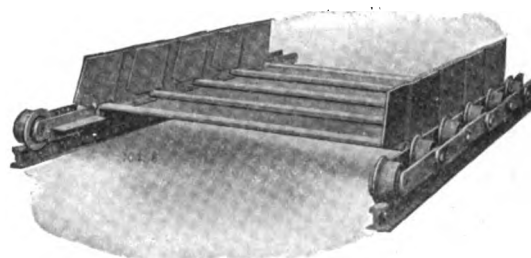
No. 2 TYPE APRON CONVEYOR

Type No. 2 is made up with roller chains of malleable iron with plain rollers for the lighter loads, and steel thimble roller chains with either plain or flange rollers for heavy work. They are intended for handling packages weighing from 100 to 1600 lbs. for a maximum distance of 200 ft.



No. 3 TYPE APRON CONVEYOR

Types 3 and 4 handle small loose material. Particularly adapted for use as apron feeders. They consist of two strands of roller chain, either malleable iron as Type 3 or steel thimble roller chain as Type 4, to which are attached double beaded steel flights with steel ends thus forming a continuous trough or apron. Standard conveyors have a capacity range of from 56 to 1000



No. 4 TYPE APRON CONVEYOR

tons per hour. Size of material may vary from dust to 24-in. cubes. These standard conveyors may be obtained in any length up to 100 ft.

Catalogue No. 258-A.

THE GODFREY CONVEYOR CO.

Manufacturers of Conveyors
ELKHART, IND.

Products

COAL and ASH HANDLING MACHINERY; HOISTS.
Also manufacturers of Handling Equipment for Sand, Lumber, Ore and Baled Materials; Car Pullers.

Engineering Service

This company maintains an engineering department composed of experts who have had many years' experience in designing coal and ash handling equipment. Inspection and instruction service is given when customers so desire. Inspection is made of each equipment and is included in the contract.

Send rough pencil sketch of railroad siding, storage grounds, bins or boiler room and the engineering department of this company will show exactly what a Godfrey conveyor can do to cut costs.

This service is without obligation on the part of the prospective purchaser.

Adaptability of Godfrey Conveyors

Godfrey conveyors are adapted for handling all sizes of coal, coke, etc., in an economical and highly efficient manner.

By substituting grab hooks for the conveying bucket, steel rails, lumber, baled materials and innumerable other commodities can be handled quickly and economically.

The illustrations show several types, but Godfrey conveyors are equally efficient and adaptable to practically every condition.

They can be successfully installed at any angle or parallel to the railroad siding in heavy cableway or I-beam types, according to conditions.

Coal may be fed into the conveying bucket by gravity through a steel track chute (as illustrated) and then elevated and conveyed to point of dumping. For this method of conveying, a pit is installed. A special pit of this company's design is recommended, which has an opening beneath the rails 6 ft. wide, to take all coal from *both* sides of side dump cars, as well as hopper bottom cars.

Distinctive Features

Economical Installation and Operation—God-

frey conveyors handle the coal mechanically, thus they greatly reduce labor cost.

Cost of installation is moderate and they effect large savings over other types of conveying systems.

Fuel Breakage Reduced—Godfrey conveyors can handle all sizes of coal, coke, etc., with practically no breakage or degradation.

This is an exclusive Godfrey feature and saves from 20c to 25c per ton on this one item alone.

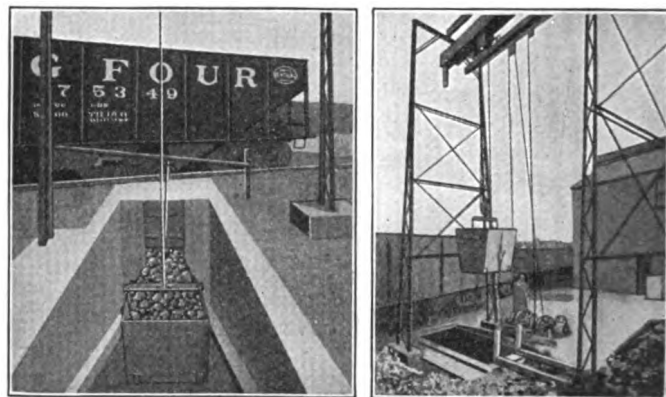
Centralization of Control—Hoist operator controls the entire operation of filling, elevating, conveying, dumping and returning the bucket to the pit for re-loading.

Elimination of Car Demurrage—Godfrey conveyors eliminate costly car demurrage due to their speedy and efficient operation.

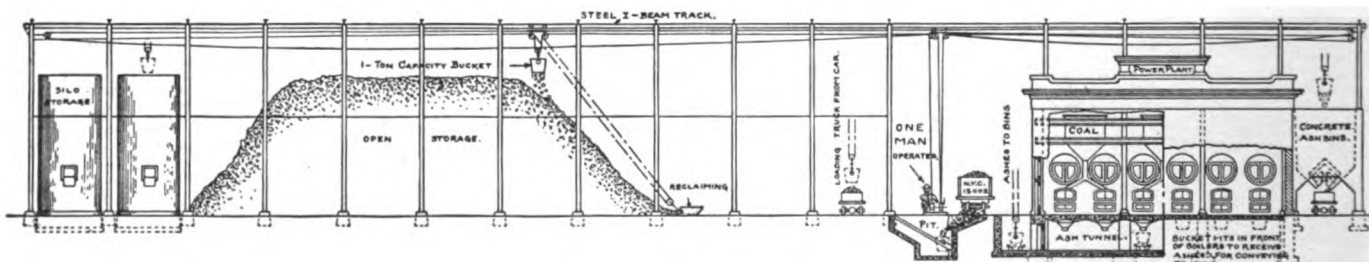
They will unload and store coal practically as fast as received.

Hoists—These are of Godfrey special design, constructed so as to handle loads at any practical speed.

They are simple, of rigid construction and are mounted on a one-piece cast iron hoist and motor base; ready to be attached to power, which may be either electric motor, gasoline engine or steam power.



SHOWING GODFREY METHOD OF TAKING COAL FROM HOPPER BOTTOM CARS



TYPICAL INSTALLATION OF GODFREY COAL AND ASH CONVEYOR

Operator at hoist controls flow of coal through steel railroad track chute to bucket in pit by means of a double action gate. Bucket is quickly filled and without danger of overflow. By means of the hoist, operator elevates bucket (containing 1 ton) to a point beneath trolley above and it is then conveyed along a monorail system of I-beam or heavy cableway to point of dumping. Bucket is dumped automatically, a trip releasing the bi-section bottom by coming in contact with the coal pile, or, where speed is of more importance than breakage of coal, bucket can be tripped from movable trip member overhead, allowing coal to fall from bucket.

Among the salient features of the new Godfrey hoist are the following:

- (1) Extreme ease of operation and perfect control by operator.
- (2) Large hoisting drum driven by patented metal to metal clutch.
- (3) Reversible traction drum driven in either direction by special metal to metal clutches.
- (4) Both drums bronze bushed revolving on heavy stationary steel shaft.
- (5) Adjustment for taking up clutch wear.
- (6) Wide asbestos-lined brake bands operated from foot pedals.
- (7) All castings carefully machined and inspected in our own factory.
- (8) All gears machine cut.

(9) Quietness of operation due to elimination of ratchet brake and chain driven gears.

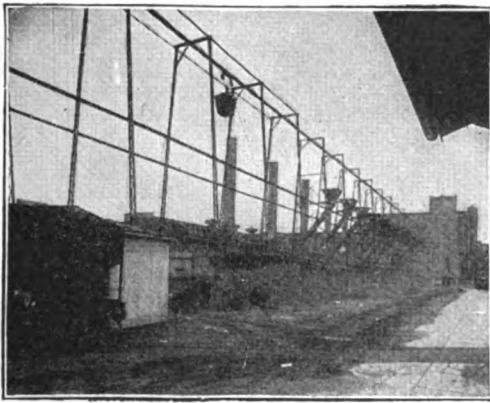
(10) Both hoisting and traction levers at operator's finger tips.

(11) Excess factor of safety in every part.

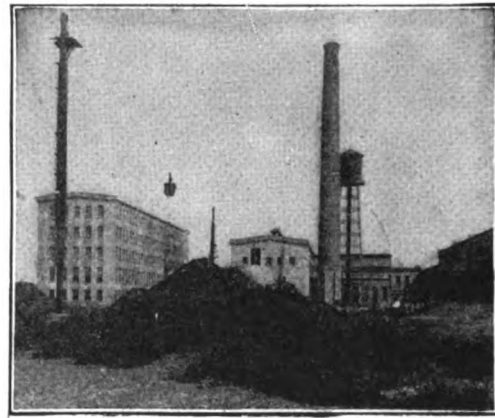
(12) Practically "foolproof."

Deliveries

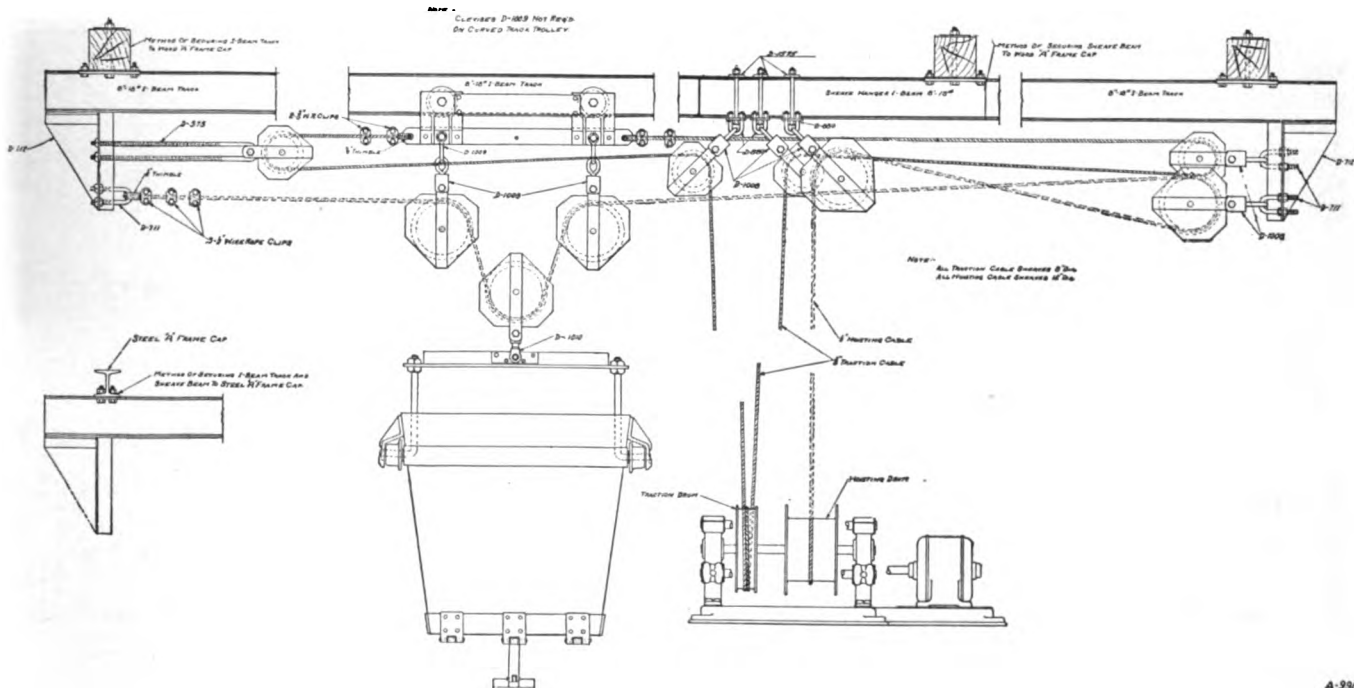
This company, due to large and efficient production facilities, is in a position to maintain a schedule of prompt delivery on its equipment. This, added to the low cost of installation and operation of its conveyor, has made possible a quick solution of conveying problems for many industries that handle coal or other materials.



A GODFREY CONVEYOR UNLOADING COAL FROM CARS
TO SELF-FEEDING STOKERS
I-beam Installation



A GODFREY CONVEYOR OPERATING BETWEEN
COAL DUMP AND BOILER ROOM
Cable Installation



DETAILS OF CABLE INSTALLATION OF THE GODFREY CONVEYOR

A-998

THE UNIVERSAL CONVEYOR CO.

SOUTH BEND, IND.

Products

Manufacturers of the UNIVERSAL CONVEYOR for handling coal, coke, sand, gravel or ashes.

Universal Conveyor

Very simple in construction and operation. The coal or other material flows by gravity from the bottom of the railroad car into a track hopper from which the bucket is filled, is elevated out of a shallow pit, and conveyed to storage or boiler house. Universal conveyors are furnished in both cableway and monorail types, yard conditions determining which is the better for each installation.

Specifications

Towers—Constructed of expanded steel beams, giving great strength.

Anchorage—Piers of concrete are designed for each type of tower. Special specifications are made for each installation.

Monorail—Consists of special section I-beam steel in 35-ft. spans, trussed to prevent buckling.

Cable—The track cable consists of 1½ in. aerial tramway cable. The hoisting and traction ropes are extra flexible for operating over sheaves.

Trolley—The trolley or carriage is 3 ft. 10 in. long. Its sheaves or wheels are large in diameter, turning on 1½-in. axles. They are bronze bushed.

Sheave Blocks—12-in. bronze bushed sheaves are used in all sheave blocks, except in the bucket block where a 14-in. sheave is used.

Bucket—The bucket is made of heavy tank plate steel, hot riveted. Weight, 650 lbs., equipped with patented dumping device. A trunnion on each side causes the bucket when lowered to glide over guides down to the chute for filling.

Power—Electric motor of standard make. Gasoline engine can be furnished if necessary.

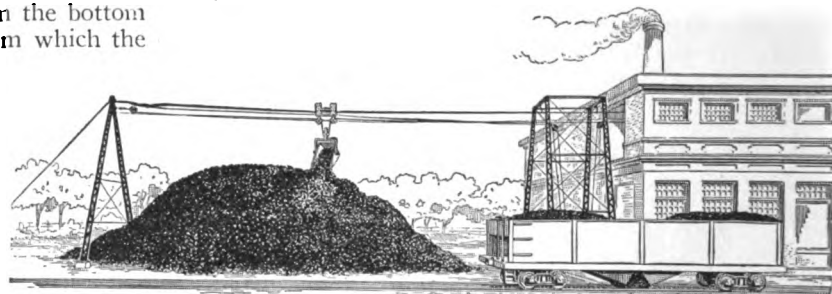
Steel Chute—Of the overcut type, made of ¾-in. plate steel.

Saddles—Designed for supporting track cable; will not interfere with operation of trolley.

Turnbuckle—Designed to maintain a uniform tension on track cable.

Lubrication—Ample provision for efficient lubrication. All accessible bearings fitted with grease or oil cups; inaccessible bearings are provided with self-lubricating bronze bushings.

Pit—The standard Universal pit contains approximately 16 cu. yds. of reinforced concrete. Depth, only 10 ft.

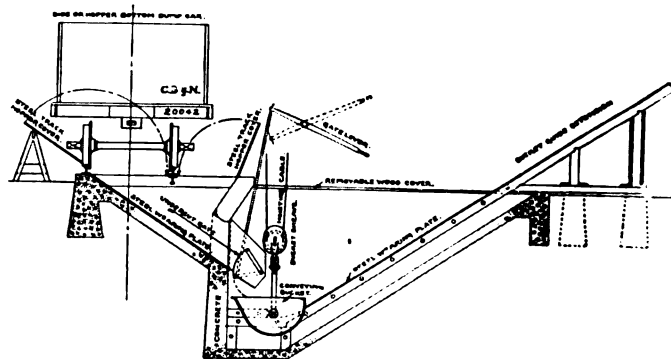


TYPICAL FACTORY INSTALLATION OF UNIVERSAL CABLEWAY CONVEYOR

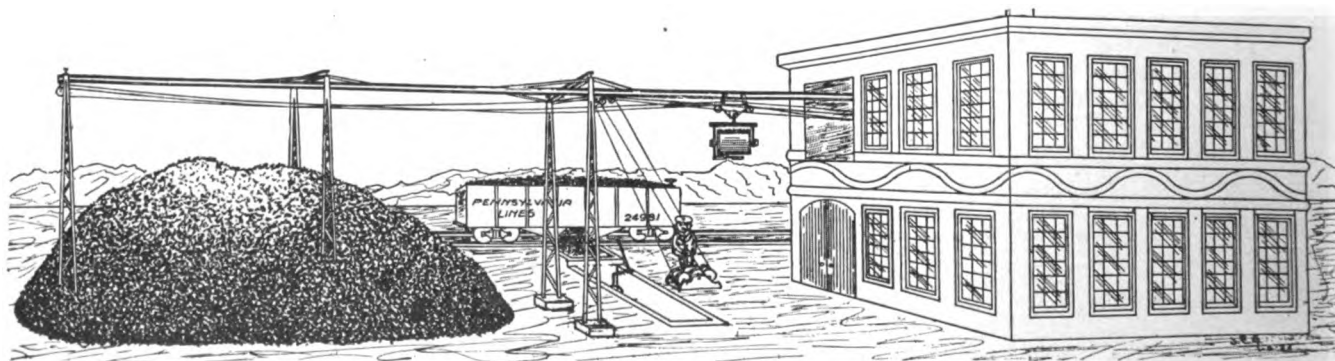
Engineering Service

The services of this company's Engineering Department are at the disposal of engineers, architects and prospective users.

Send rough layout showing location of siding, storage space, bins, and give approximate annual tonnage of coal or other material handled. From this data, an estimate will be prepared showing cost of installation of a Universal conveyor. This service is without charge or obligation.



OPERATING DIAGRAM UNIVERSAL CONVEYOR, SHOWING DETAIL OF TRACK HOPPER AND PIT



TYPICAL FACTORY INSTALLATION OF UNIVERSAL MONORAIL CONVEYOR

C. L. INSLEE

W. G. HUDSON

EDWARD BURNS

W. W. RICKER

GUARANTEE CONSTRUCTION COMPANY

Coal and Ash Handling Equipment

144 Cedar Street
NEW YORK, N. Y.

Products and Services

ELEVATING and CONVEYING EQUIPMENT for coal, ashes and other materials.

STORAGE BINS and BUNKERS of steel, timber and reinforced concrete.

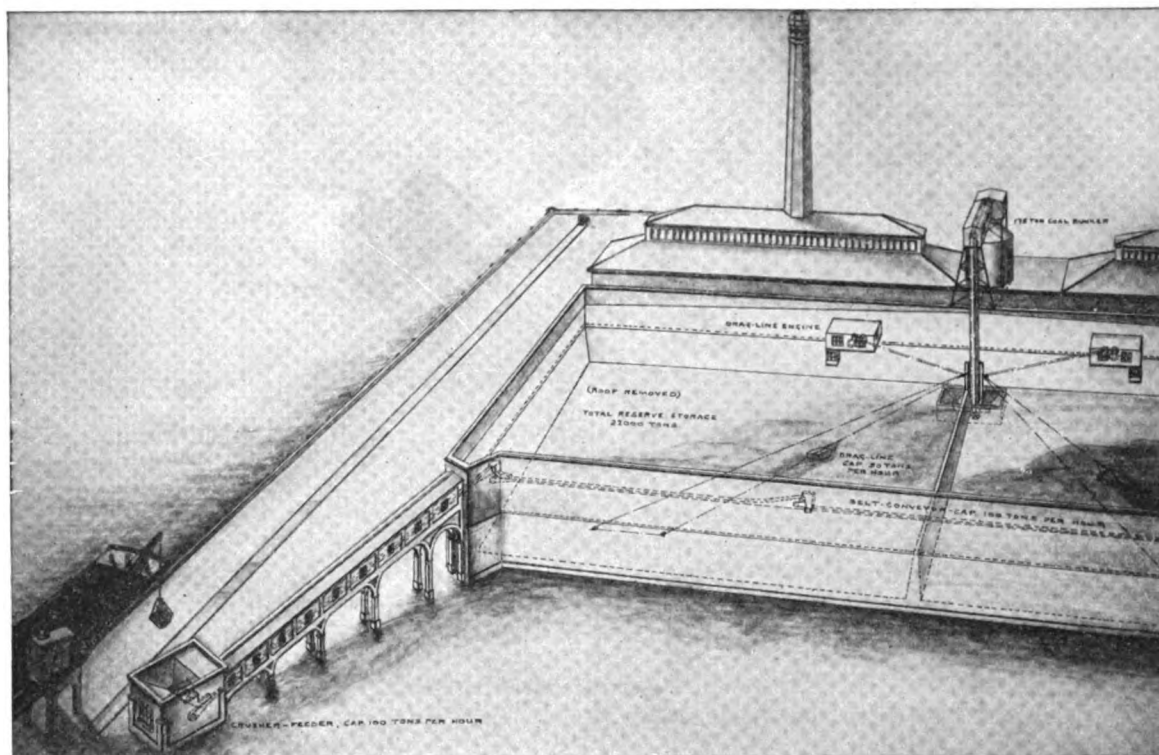
SKIP HOISTS, semi- and full-automatic.

DRAGLINE SYSTEM of Coal Storage.

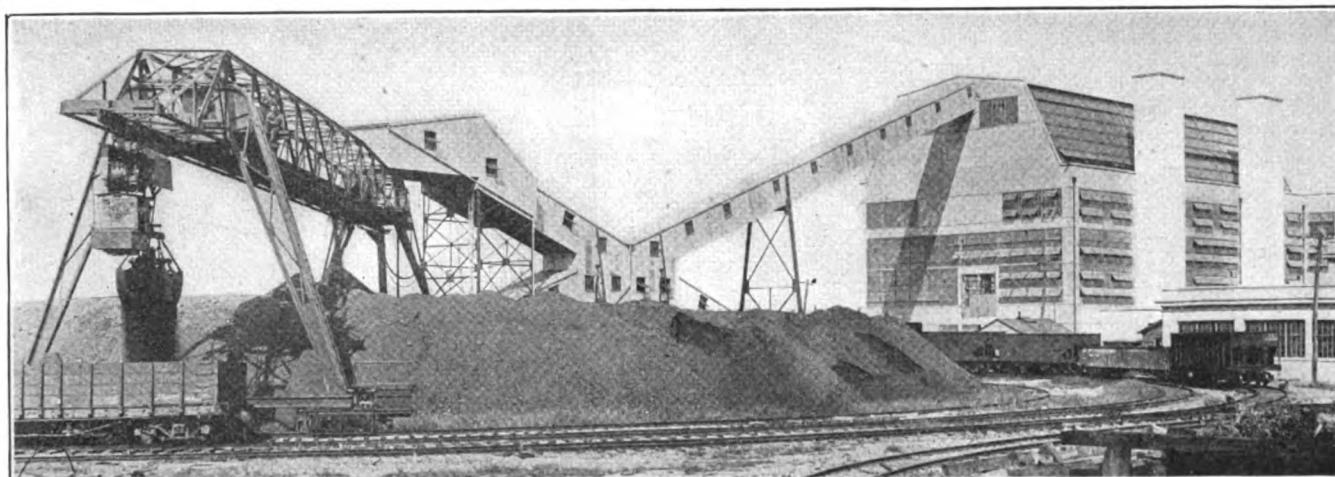
PNEUMATIC CONVEYORS.

COAL STORAGE PLANTS.

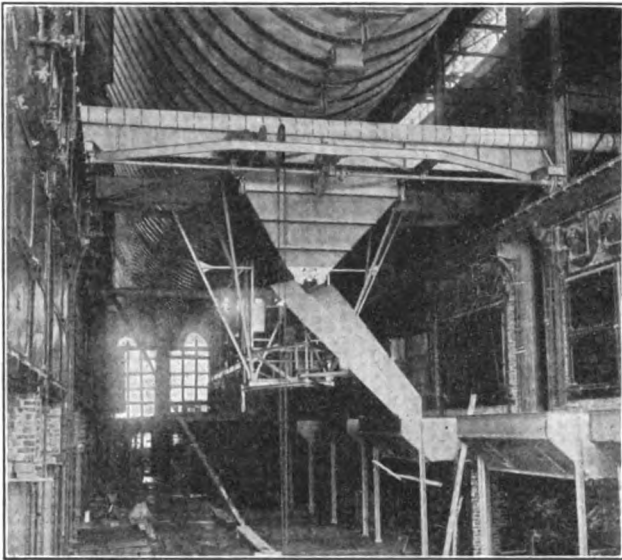
Designers and Builders of complete POWER and INDUSTRIAL PLANTS, including Foundations, Structures and Mechanical Equipment.



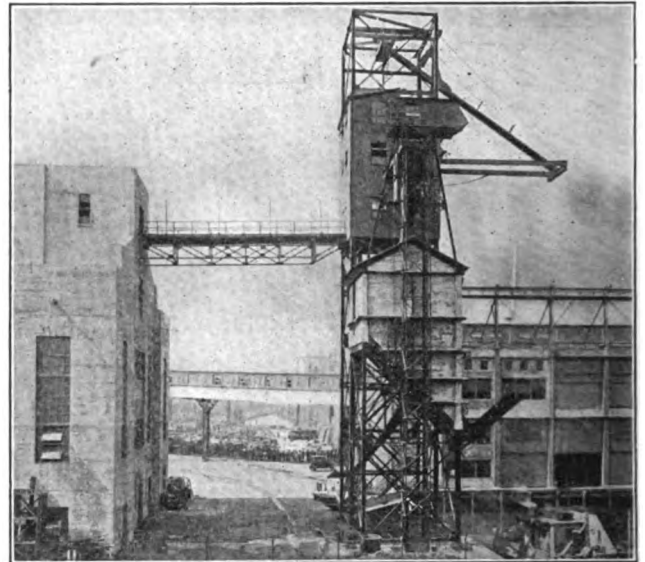
COAL STORAGE EQUIPMENT FOR THE CITY OF DETROIT, SHOWING USE OF DRAGLINE SYSTEM FOR STOCKING OUT AND RECLAIMING COAL ADJACENT TO THE POWERHOUSE



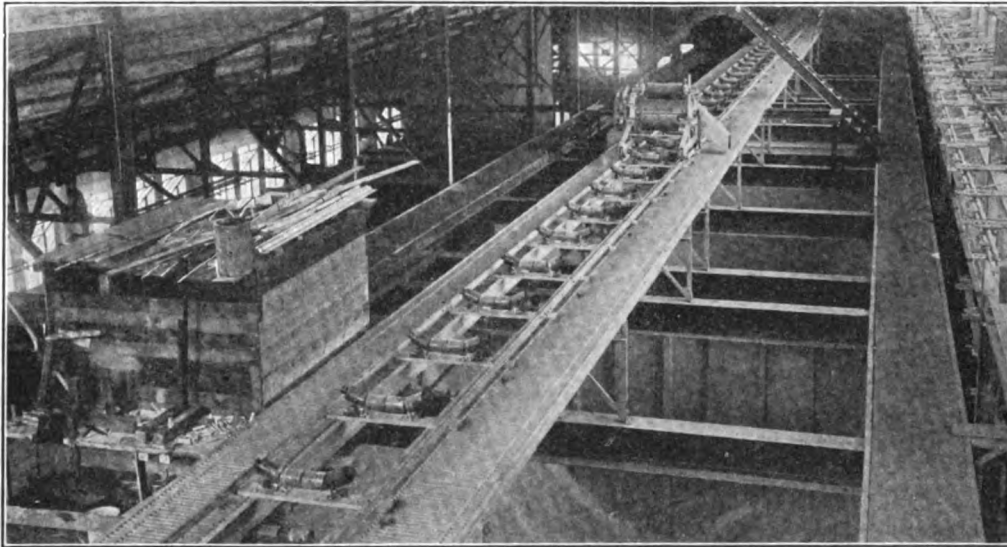
COAL HANDLING AND STORAGE PLANT FOR THE MAIN POWERHOUSE, PHILADELPHIA NAVY YARD, CAPACITY 150 TONS PER HOUR
This was our tenth Government contract secured through competitive design



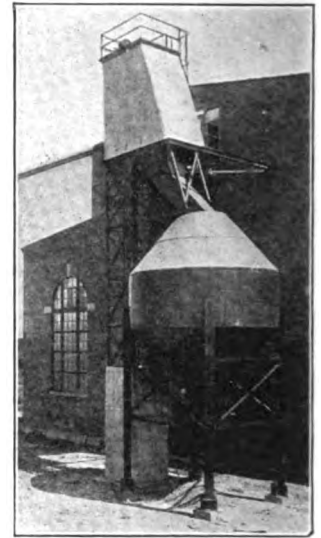
WEIGHING LARRIES, $\frac{1}{2}$ TO 20 TONS CAPACITY



INCLINED BOOM COAL TOWER FOR CAPACITIES UP TO 100 TONS PER HOUR



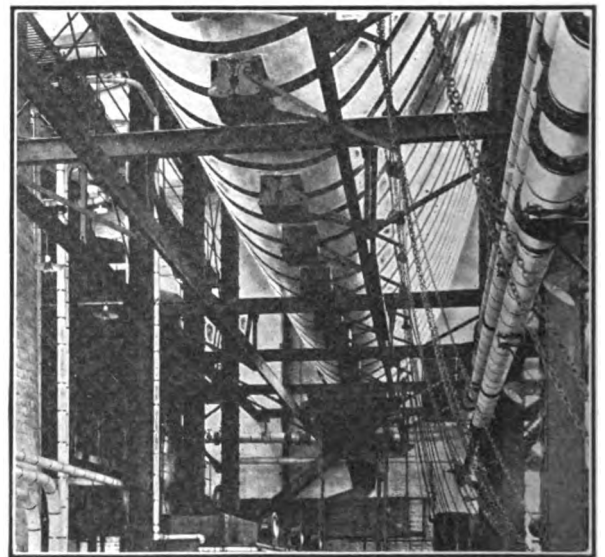
BELT CONVEYOR FOR 200 TONS PER HOUR CAPACITY, IN COURSE OF ERECTION, WITH SUSPENDED BUNKER BENEATH



AUTOMATIC AND SEMI-AUTOMATIC SKIP HOISTS



COAL AND ORE UNLOADING EQUIPMENT, ELECTRICALLY OPERATED



CONCRETE SUSPENSION TYPE STORAGE BUNKERS
Have been in service twenty years with no evidence of depreciation

The Airveyor (Pneumatic Conveyor)

The most efficient means of handling and conveying pulverized and granular materials such as lime, cement, soda ash, coke, charcoal, ashes, wheat, corn, grains, food products, etc.

With the Airveyor the nuisance and hazard of dust are eliminated, and labor costs greatly reduced.

It has no moving parts except the motor and exhauster, and the cost of upkeep is exceptionally low.

Literature

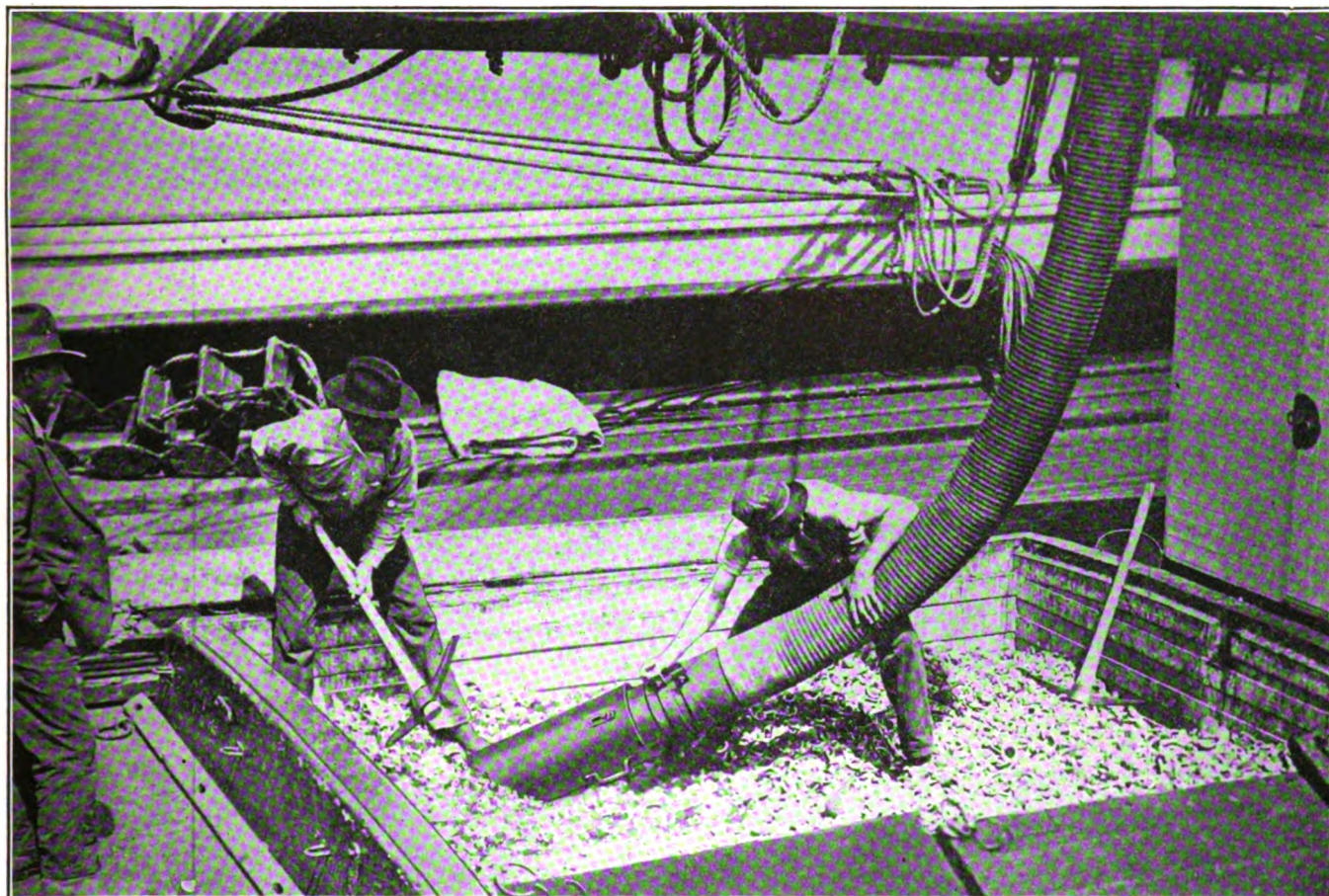
Separate bulletins—

102—Coal Pockets for Anthracite.

124—Coal and Ash Handling Equipment.

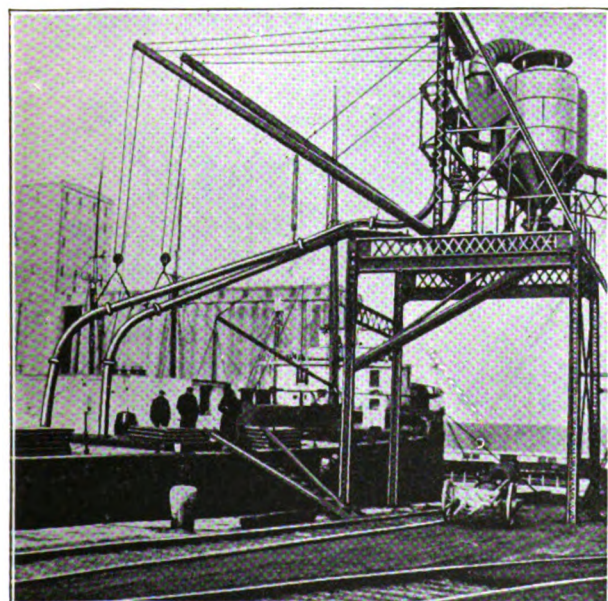
125—Mills and Power Plants.

126—The Airveyor.



AIRVEYOR UNLOADING BULK CARGO OF COPRA ON THE PACIFIC COAST WITH ONE-THIRD THE NUMBER OF MEN AND MAKING A NEW RECORD FOR SPEED OF HANDLING

The equipment includes car loader. Box cars are loaded to maximum capacity by blowing material into ends at high velocity



REVERSIBLE PNEUMATIC CONVEYOR FOR TRANSFERRING GRAIN FROM BOATS OR CARS TO STORAGE ELEVATOR AND FROM STORAGE ELEVATOR BACK TO BOATS



PULLING IT FROM THE CAR AT THIRTY TONS PER HOUR BY THE AIRVEYOR

HEYL & PATTERSON, INC.

Contracting Engineers

MAIN OFFICE AND PLANTS

PITTSBURGH, PA.

BRANCH OFFICE: 90 West Street, NEW YORK, N. Y.

Maintain Complete

Engineering Organization.
Structural and Machine Shops.
Field Forces.

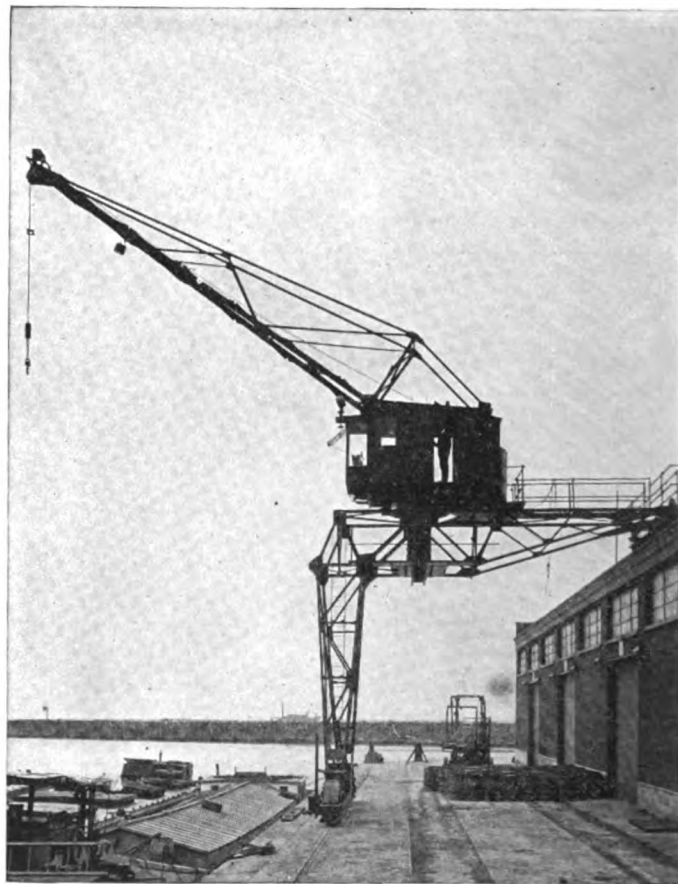
Prepare Estimates, Plans and Specifications and Design and Erect the following Products:

Apron Conveyors
Belt Conveyors
Batch Mixing Plants
Bradford Breakers
Car Haulage Systems
Coal and Ash Handling Apparatus
Coal and Coke Crushers
Coal and Coke Plants for By-product Coke Ovens
Coal, Coke and Ore Storage Bridges and Cranes
Coal Washing Plants and Larry Bins
Gas Producer Plants

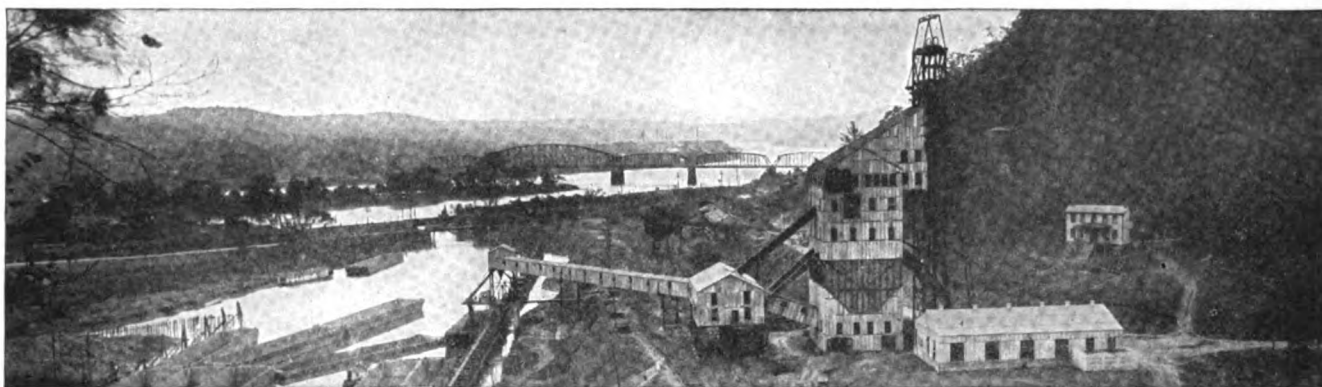
Lehr Conveyors
Loading Booms
Ore Handling Bridges
Picking Tables
Pig Iron Casting Machines
Pulverized Coal Equipments
Refuse Disposal Cars
Rope Haulage Systems
Rotary Dumps
Screening Plants
Shaking Screens
Storage Plants
Telphers
Tipples and Equipment
Transfer Cars
Traveling Batch Mixers
Unloading Towers
Wharf and Cargo Cranes



PIER CRANE
50-ton capacity



WHARF CRANE
3-ton capacity



HEADFRAME AND TIPPLE FOR RAIL AND RIVER LOADING



COAL HANDLING BRIDGES



HEADFRAME AND LOADING BIN



HEADFRAME AND TIPPLE

FOUNDED 1880

THE BROWN HOISTING MACHINERY CO.

Manufacturers of Coal and Ash Machinery and Bins

CLEVELAND, OHIO

BRANCH OFFICES

NEW YORK, N. Y., 50 Church Street

CHICAGO, ILL., 208 South La Salle Street

PITTSBURGH, PA., Oliver Building

NEW ORLEANS, LA., Whitney-Central Building

SAN FRANCISCO, CAL., Monadnock Building

EUROPEAN REPRESENTATIVE, H. E. HAYES, 12 Rue de Phalsbourg, PARIS, FRANCE

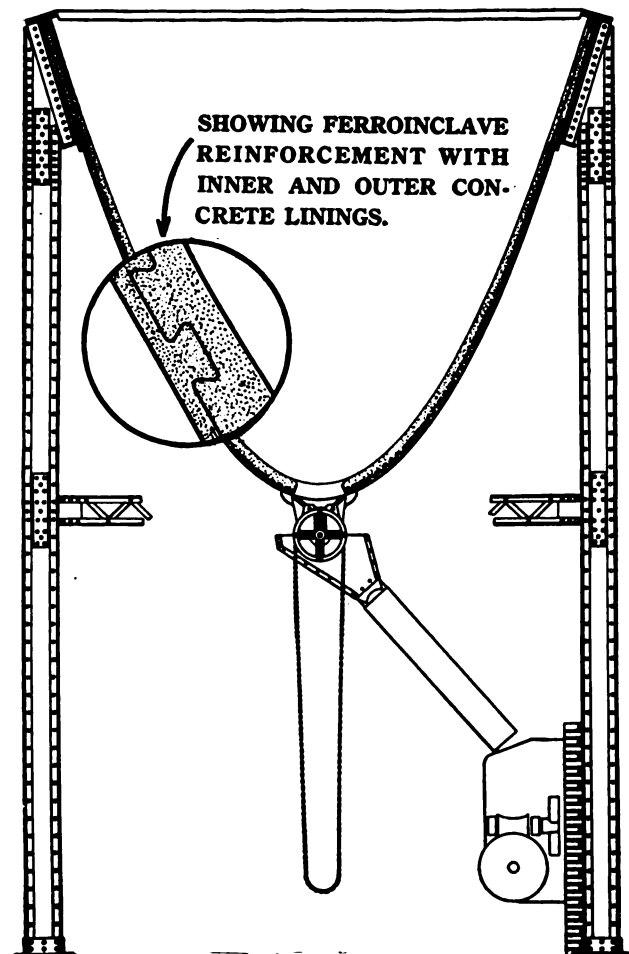
Products

BROWNHOIST PATENT SUSPENDED BIN;
BROWNHOIST COAL and ASH HANDLING MA-
CHINERY; BROWNHOIST WEIGHING LARRY.

For Locomotive Cranes, see pages 24-25; for Grab Buckets, see pages 34-35.

Brownhoist Suspended Bin

The Brownhoist patent suspended bin is a concrete bin for storing coal and ashes. It consists of two horizontal steel plate girders supported by upright columns, and from these girders the bin structure is suspended. At intervals of from 3 to 5 ft. steel straps, which are parabolic in shape, are hung from these girders. To the inside of these straps, our patent solid sheet-steel reinforcement Ferroinclave is bolted, a wooden strip being placed between the Ferroinclave and the straps to prevent corrosion.



SECTIONAL VIEW OF BROWNHOIST CONCRETE COAL BIN

BROWNHOIST TRADE-MARK

When the Ferroinclave is in place, the inside is coated with concrete. The thickness of this lining varies with the span and loading. When this has set, the outside is covered with concrete.

Capacities—The capacities depend on the requirements of the customer, but they range from 1 to 20 tons per lin. ft.

Advantages—This bin lasts a lifetime as all the steel is protected by the concrete; is fireproof; holds a maximum amount of coal in minimum space; is practically self-emptying; low cost of operation; makes a clean and neat boiler room.

Gates and Spouts—The bin is equipped with Brownhoist gates and spouts. The gates are easily operated from the floor, and are automatically locked when closed and when opened the full width.

There are three kinds of spouts: The swinging, the stationary, and the stationary angle—which one to use depends on requirements of the plant.



VIEW OF BROWNHOIST COAL BIN
SHOWING DISTRIBUTING
SPOUTS

Weighing Larry

A Brownhoist weighing larry can be put beneath the bin and it will weigh every pound of coal as it passes to the stokers.

Coal and Ash Handling Machines

Brownhoist coal and ash handling machines, of various types and designs, consist of the locomotive crane, man trolley, overhead traveling crane, gantry crane, and bridge crane—all used with Brownhoist buckets or tubs.

Estimates, etc.

On receipt of plans and requirements, we will submit estimates on the entire installation in new or old plants. Many views of the bin and machines in use are shown in our catalogue "S."

CONVEYORS CORPORATION OF AMERICA

FORMERLY AMERICAN STEAM CONVEYOR CORPORATION

Conveyor Engineers
326 West Madison Street
CHICAGO, ILL.

ENGINEERING SALES OFFICES IN ALL PRINCIPAL CITIES

Products

AMERICAN STEAM ASH CONVEYORS.

Also manufacturers of Airtight Ashpit Doors, Locomotive Cinder Pit Ejectors, Locomotive Sand Handling Systems, Marine Ash Ejectors, Cast Iron Storage Tanks, Special Hard Metal Castings.

Scope of Use

For the economical handling of ashes, combustion ashes, soot, blast furnace dust, coal siftings, etc., from boiler or furnace room to any point desired.

Construction and Operation

An American Steam Ash Conveyor consists of a heavy pipe line made of hard new pig iron and special patented fittings with removable hard metal wear parts. This pipe line is installed in the boiler house and ash intakes are located at the most convenient points. The installation requires only enough space for a 6-in. or 8-in. pipe line.

Systems are made in units, 4, 6 and 8 in. in diameter. The 6-in. diameter and smaller sizes are used for conveying soot from economizers, breechings, combustion chambers of boilers, and coal siftings from stokers.

One man rakes the ashes into an intake conveniently located. He turns a valve, the suction of a steam jet shoots the ashes through a pipe (100 ft. up if required) 100 to 300 ft. away, to pit, pile, over-head hopper, car, wagon—anywhere desired.

Advantages

Old and new plants, hand and stoker fired, are easily equipped with American Steam Ash Conveyors. Little space is

required and installation in every condition can be met. Delivery of ashes may be vertical, horizontal, or around corners to any point desired.

The use of an American Steam Ash Conveyor releases from one to six men to engage in labor more productive to their employer.

Cost

The first cost is low. Installation is simple, and valuable space is not taken up. The steam consumption is inconsiderable. The stamina of the conveyor is such that repairs or replacements of parts are seldom necessary and entail very little work, which can be quickly and easily done under the direction of the house engineer.

Service

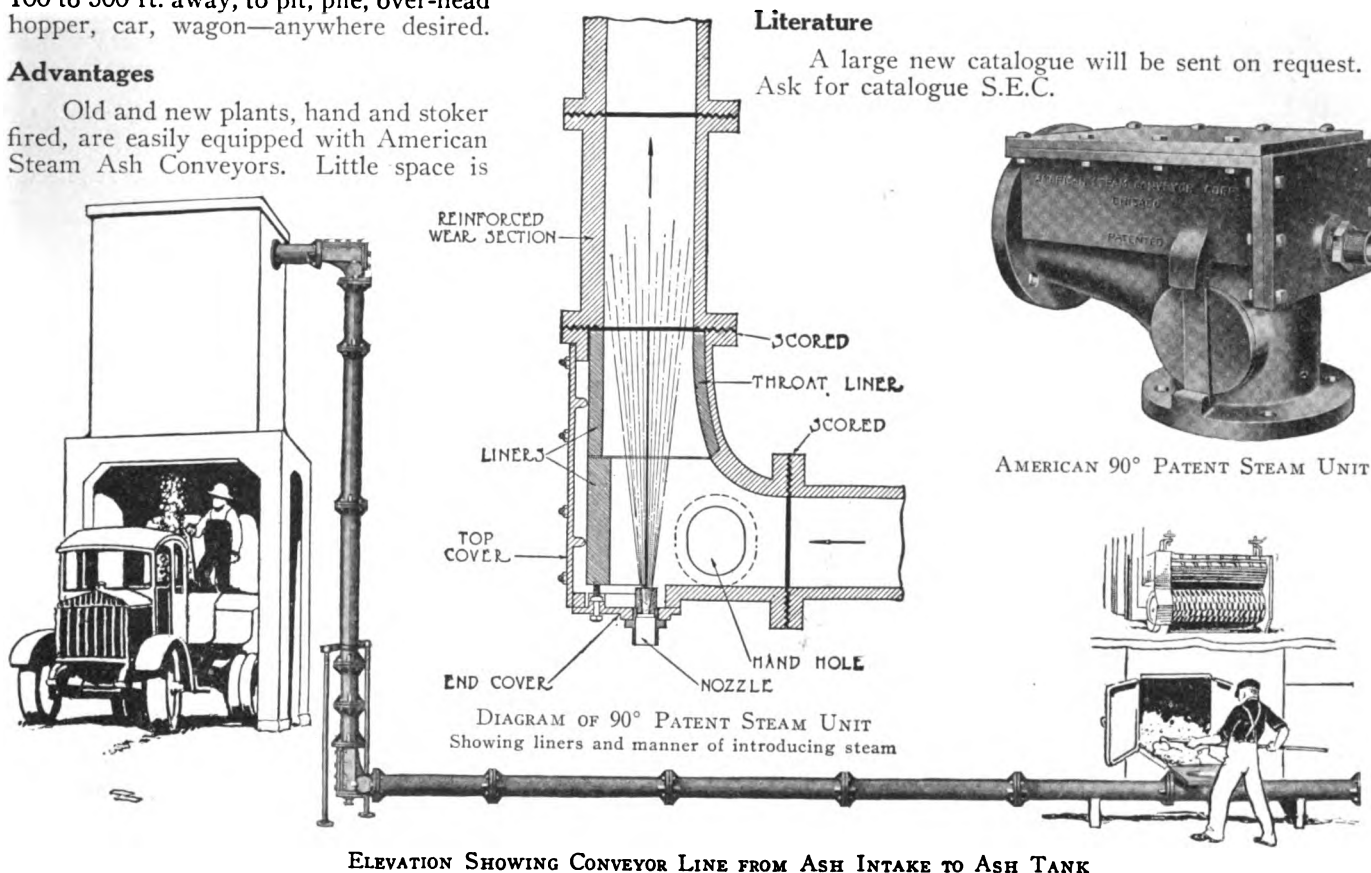
The great success of American Steam Ash Conveyors is the direct result of scientific experiment and exhaustive tests by the engineers of this corporation. Experts in ash handling give each contract personal attention.

Installations

1,200 American Steam Ash Conveying Systems are in daily use in this country and Canada. One of these plants is located near you, and the address will be furnished to those interested.

Literature

A large new catalogue will be sent on request. Ask for catalogue S.E.C.



M. H. DETRICK COMPANY

Manufacturers of Steam Jet Ash Conveyors

155 East Superior Street
CHICAGO, ILL.

DISTRICT SALES OFFICES

ATLANTA, GA.
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CHICAGO, ILL.
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SEATTLE, WASH.
SAN FRANCISCO, CAL.
TULSA, OKLA.
SALT LAKE CITY, UTAH

MONTREAL, QUE.

Products

DETRICK-HAGAN STEAM JET ASH CONVEYOR.
For Detrick Arches, see page 501.

Detrick-Hagan Steam Jet Ash Conveyor

The steam jet ash conveyor is the simplest type of ash handling equipment, requiring practically no labor. The Detrick-Hagan steam jet ash conveyor is the simplest of this type, being composed of the fewest number of standard parts and interchangeable wherever possible. Parts can be easily and quickly renewed when necessary.

The system consists of a pipe line through which ashes are first drawn and later pushed through to the tank or car by means of steam issuing at high velocity from a specially designed nozzle.

The Detrick-Hagan piping and elbows are cast from a special white iron developed in the Detrick-Hagan foundry and used exclusively by them. This special white iron has the highest resistance to abrasion of any material now being used in the making of fittings for steam jet ash conveyors.

The pipe connections are made by solid flanges bolted together by means of a malleable flange coupling entirely separate from the pipe, which is cast in two pieces to form the joint of the pipe. The joint is made airtight by means of a round rubber gasket inserted in a groove provided in the flange. This coupling—a special Detrick-Hagan feature—permits the pipe to be turned any number of degrees desirable

to offset wear, due to the abrasive action of the ashes. It also provides a flexible joint.

With other systems it is customary to connect the pipe flanges direct with bolts. This makes it possible to move the pipe only the distance between drill holes. Also, it makes such a rigid connection that the cast iron pipe often breaks, due to expansion and contraction.

Detrick-Hagan elbows are furnished with special reversible and interchangeable backs, necessitating the stocking of the fewest possible repair parts. The Detrick-Hagan target box is provided with a special impact pocket in which the first ashes carried through the conveyor lodge and act as a wearing back for those that follow. This gives this particular fitting practically the lifetime of the entire system.

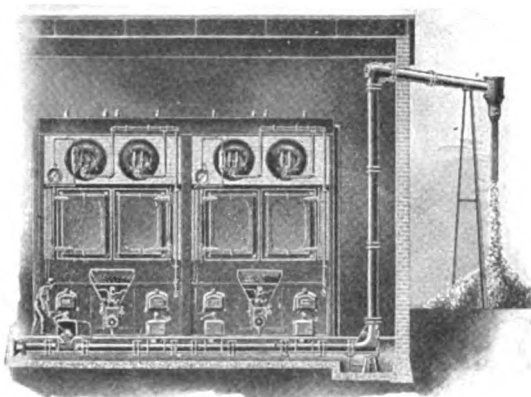
Information About Steam Consumption and Labor Costs

The Detrick-Hagan steam jet ash conveyor catalogue is a complete textbook covering the installation of ash conveyors and showing complete charts which will give cost in steam consumption of any system that might be required.

It also shows sample installations of the Detrick-Hagan steam jet ash conveyor with the aid of which you can practically estimate what would be required. Write for a copy.

Users

American Shipbuilding Co., Cleveland, Ohio
American Woodworking Machinery Co., Rochester, N. Y.
Baltimore & Ohio R. R. Co., Cumberland, Md.
Blake-Knowles Pump Works, East Cambridge, Mass.
Brown Hoisting Machinery Co., Cleveland, Ohio
Cambridge Electric Light Co., East Cambridge, Mass.
Cleveland City Railways Co., Cleveland, Ohio
Consolidation Coal Co., Jenners, Pa.
Detroit Public Lighting Commission, Detroit, Mich.
Dibold Safe & Lock Co., Canton, Ohio
Fulton Bag and Cotton Mills, Atlanta, Ga.
Hecker, Jones, Jewell Milling Co., New York, N. Y.
Heine Safety Boiler Co., Phoenixville, Pa.
John F. Boyle, Jersey City, N. J.
John & James Dobson, Philadelphia, Pa.
Laclede Steel Co., Alton, Ill.
LeBlond Machine Tool Co., Cincinnati, Ohio
McKinley Steel Co., Cleveland, Ohio
Pennsylvania R. R. Co., Erie, Pa.
Pennsylvania R. R. Co., Renovo, Pa.
Philadelphia & Reading R. R. Co., Philadelphia, Pa.
Post & Vanderwoort, East Moline, Ill.



A TYPICAL DETRICK-HAGAN INSTALLATION

UNITED CONVEYOR CORPORATION

Steam Jet Ash Conveyors

1501 Old Colony Building
CHICAGO, ILL.

Products

CONVEYORS for Ash, Coal, Soot and other materials.
STORAGE TANKS.

Also manufacturers of Coal and Ash Gates; Air-tight Ash Pit Doors.

United Steam Jet Ash Conveyor

Consists of a pipe system made of special hard white iron which is practically immune from wear. The pipe line extends from the furnace ash doors or pits to any desired place of ash disposal. Ashes are simply hoed into the ash intakes of the conveyor and a powerful current of air, generated by the steam jet, carries the ash and clinkers to the place of disposal—swamp, waste ground, direct to car or storage tank. It is the simplest system known; no moving parts; nothing to get out of order. This conveyor is adaptable to any size boiler plant and all furnaces whether hand or stoker fired. It takes practically no space in the boiler room and the installation in new or old plants is simple and inexpensive. It does not require experts to install, or an

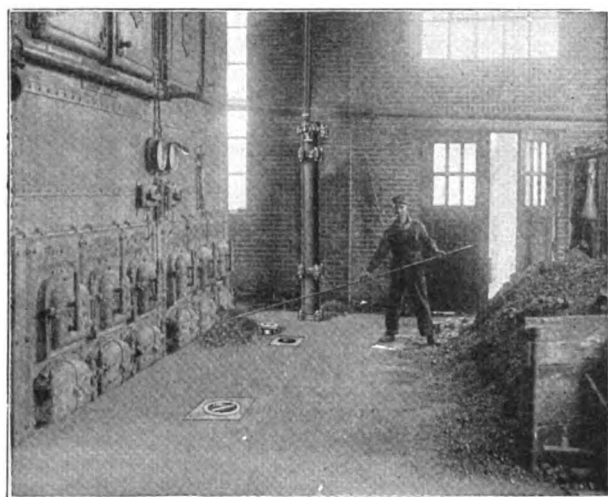
experienced man to operate it. The success of the United conveyor and its unusual low operating and maintenance cost is due to our special hard wear resisting metal and simple and logical design, combined with the placing of *exterior renewable wear sections* at the places of greatest wear.

Storage Tanks

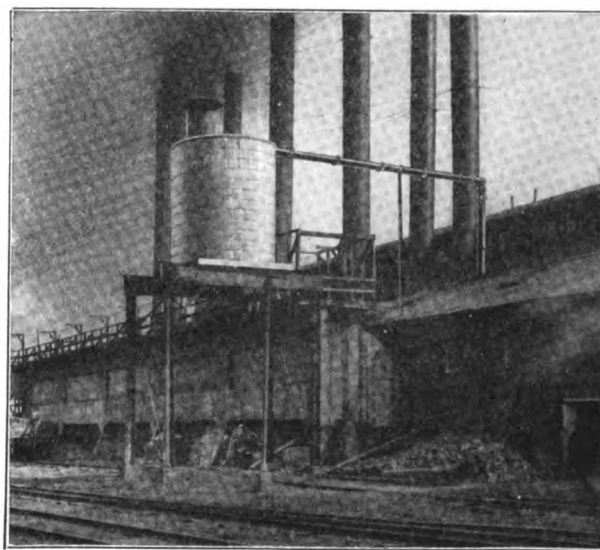
"United" steel reinforced, glazed hollow tile tanks are unexcelled for ash storage. They are built of lasting material and permanent construction; are fireproof, absolutely prevent freezing of ash in the tank and are easy to erect. Furnished knocked down in all sizes from 10 to 150 tons capacity.

Bulletin

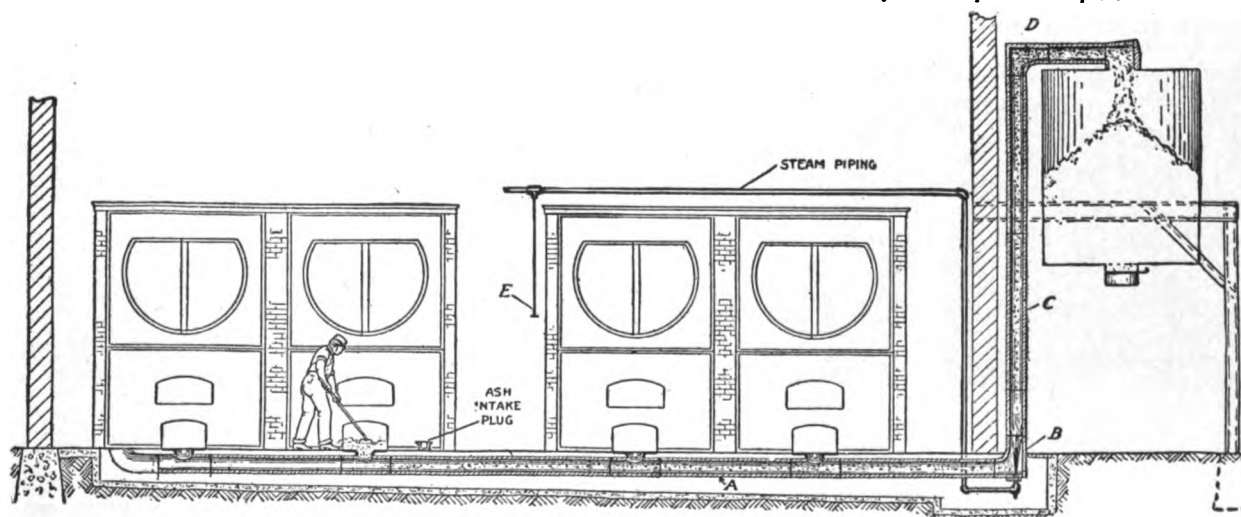
Write for our new bulletin. Our engineers will gladly aid you in the solution of coal and ash handling problems.



ASHES BEING HOED INTO INTAKES OF CONVEYOR



CONVEYOR DELIVERS ASHES TO STORAGE TANK
Or any desired place of disposal



TYPICAL SMALL INSTALLATION OF UNITED STEAM JET ASH CONVEYOR

THE LAMSON COMPANY

Designers and Builders of Automatic Conveying Machinery

100 Boylston Street
BOSTON, MASS.

WORKS:
LOWELL, MASS.
TORONTO, CANADA

REPRESENTATIVES

ATLANTA, GA., 30 Moore Building
BALTIMORE, MD., Equitable Building
CHICAGO, ILL., 6 North Michigan Avenue
CINCINNATI, OHIO, 119 East 5th Street
CLEVELAND, OHIO, 2063 East 4th Street
DENVER, COLO., 1622 Arapahoe Street
INDIANAPOLIS, IND., Washington and Illinois Streets
KANSAS CITY, MO., 210 New Ridge Building
LOS ANGELES, CAL., 221 San Fernando Building
MINNEAPOLIS, MINN., 320 Tribune Annex

NEW YORK, N. Y., 9-11 East 37th Street
OMAHA, NEBR., 418 McCague Building
PHILADELPHIA, PA., 210 North Broad Street
PITTSBURGH, PA., 319 Third Avenue
ROCHESTER, N. Y., 194 East Main Street
SAN FRANCISCO, CAL., 617 Mission Street
SEATTLE, WASH., 215 Stewart Street
ST. LOUIS, MO., 709 Pine Street
TORONTO, CANADA, 136 Simcoe Street
VANCOUVER, B. C., 104 Empire Building

For Texas, Oklahoma, New Mexico and Western Louisiana Business, refer to
THE LAMSON COMPANY OF TEXAS, Dallas, Tex.

Products

CONVEYING SYSTEMS for Cash, Papers, Merchandise and Products for All Industries.

PNEUMATIC DISPATCH TUBE SYSTEMS.

CONVEYORS: Gravity Roller, Belt and Automatic Selective Power.

SPIRAL CHUTES; SPIRAL CONVEYORS.

Also manufacturers of Selective Overhead Power Conveyors; Light Hand and Electric Power Elevators and Lifts; Electric Cable and Wire Line Cash and Parcel Carriers; Sectional Metallic Receiving and Storage Bins.

Adaptability of Lamson Conveying Systems

Lamson automatic conveying systems are as varied as industry itself, and adapted for a wide range of usefulness in nearly every conceivable business. They carry practically everything that is ordinarily handled



TRADE-MARK

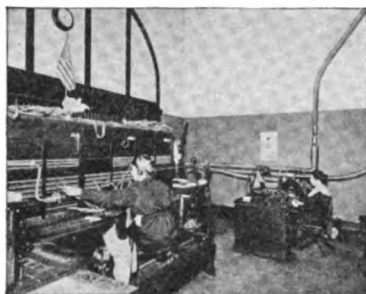
—from papers, currency and the most fragile products to boxes, barrels, tools, castings, machine parts, etc.

No matter what the business is, Lamson conveying systems will *save time and expense*, and enable the organization to perform *more work with less effort*.

Lamson Service

Specialists employed by this company are constantly solving all kinds of conveying and carrying problems, and their experience and service are at the disposal of those who desire a satisfactory solution of their conveying needs.

Full information covering any problem to which Lamson conveyors may be adapted will be furnished, without obligation.



Telegrams and messages relayed all over the factory by the Lamson tube station



Labor, and the movement of materials, controlled from the central planning department. Lamson pneumatic tubes give practically instantaneous message service to all parts of the plant



This Lamson tube service provides a quick, mechanical messenger between shop and main office



Papers are kept moving between executives and department heads by Lamson pneumatic tubes



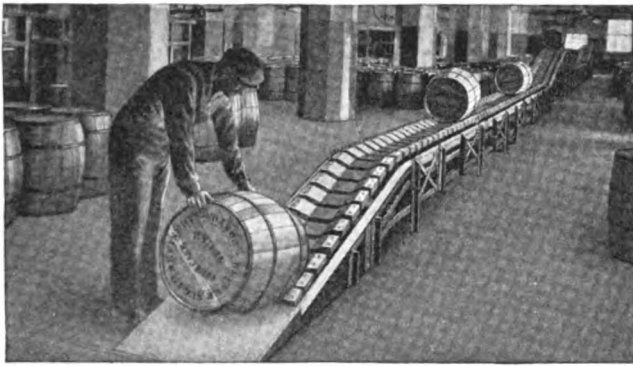
This central desk serves the same purpose for the tube system as a central telephone switchboard. Incoming pneumatic carriers are here relayed to destination



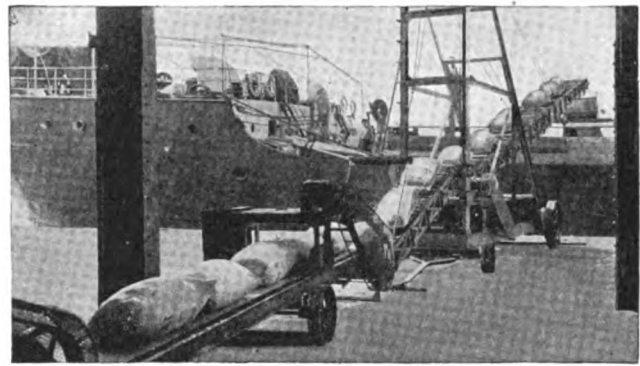
In banks, checks and debit and credit items are kept moving by Lamson pneumatic tubes

LAMSON PNEUMATIC TUBES, THE SWIFT MECHANICAL MESSENGERS OF BUSINESS

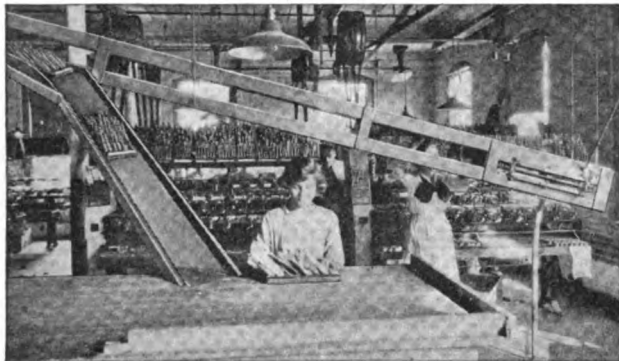
These illustrations show how Lamson pneumatic tubes speed up and systematize the transaction of business by carrying letters, requisitions, orders and other papers quickly and surely in the factory, office, bank and business house



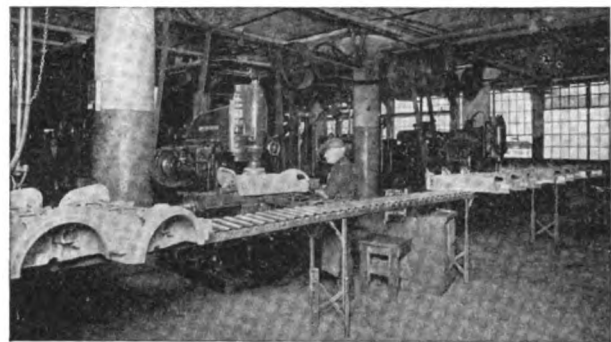
This heavy duty conveyor is built in different types to carry barrels, cases, castings, bales, and other loads. It conveys over level or inclined lines and delivers and receives to and from heavy duty elevators



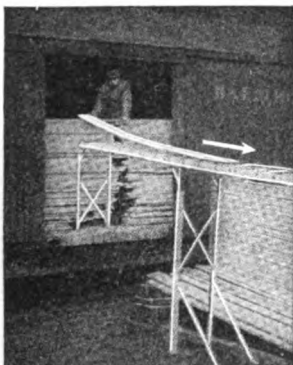
This heavy duty Lamson piler or inclined conveyor with accompanying level units carries crates, bales, bags, and practically all products handled at docks, railroad terminals, and in warehouses



In textile mills, Lamson conveyors carry bobbins, laps, raw cotton, finished cloth, etc. Lower belt of this 2-way conveyor brings empty silk quills to filling machines. Upper belt returns filled quills



Castings and parts carried between machines in the modern machine-shop. Conveyors keep stock in motion between processes and link a battery of machines into one complete unit



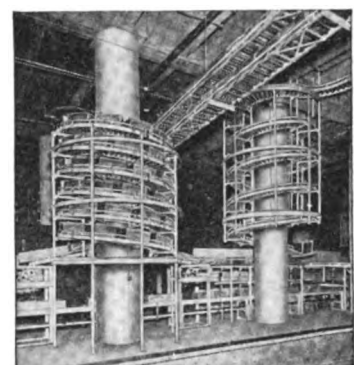
Lumber, boards, shooks and other wood products easily carried on Lamson gravity and power conveyors



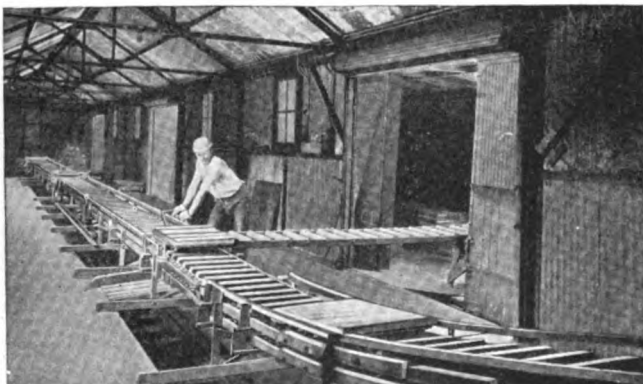
Tote boxes of small parts carried by gravity or by this chain conveyor



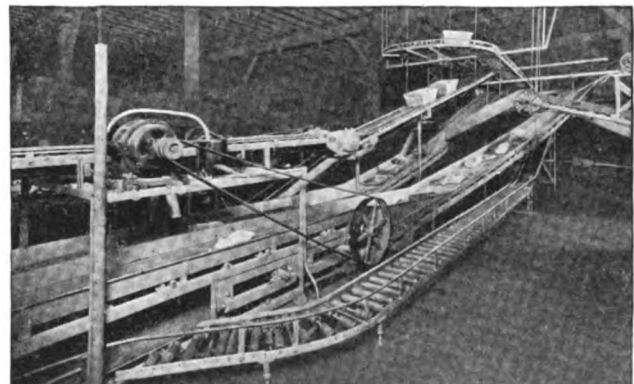
Lamson spiral chutes carry a steady stream of packages vertically downward, quickly and without attention and without damage



Lamson gravity spiral conveyors carry packages downward to shipment and also serve as "live storage"



Lamson slat conveyors are used for loading and unloading freight cars and for carrying all kinds of bulky and heavy products



This system of Lamson power and gravity conveyors is used to facilitate handling and sorting packages in a mail order house

LAMSON GRAVITY AND POWER CONVEYORS

The laying out of complete systems of conveyors is an important part of the service offered by THE LAMSON COMPANY

STANDARD CONVEYOR COMPANY

Pneumatic Tube Systems
NORTH ST. PAUL, MINN.

BRANCH OFFICES

CHICAGO, ILL., 549 West Washington Street
MILWAUKEE, WIS., 606 Security Building

CLEVELAND, OHIO, 225 Electric Building

NEW YORK, N. Y., 227 Fulton Street
BOSTON, MASS., 113 State Street

Products

PNEUMATIC TUBE SYSTEMS; POWER SAVING DEVICES.

Also manufacturers of Wire Line Cash and Message Carriers, and Cash and Message Lifts.

For Gravity Conveyors and Chutes, see page 816.

Patents

These products are covered by patents in the United States and Canada.

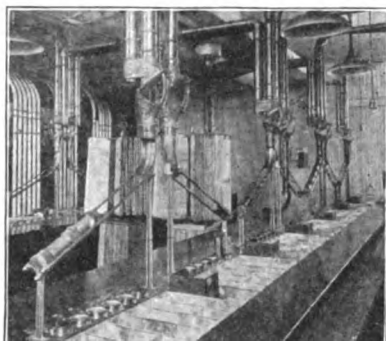
Pneumatic Tube Systems

The addition to the STANDARD CONVEYOR COMPANY'S line of labor saving indoor transportation systems, of the well established line of pneumatic tubes and silent messenger equipment formerly manufactured by the Perrine Store Service Co., Minneapolis, puts *Standard Service* in a distinctive class.

Every labor-time-saving conveyor or mechanical device required for the rapid indoor transportation of merchandise, written orders, cash or messages, is included in *Standard Service*.

Types—Vacuum—Independent, twin tube line for each substation. Operated by low pressure, positive exhaustor or centrifugal exhaustor.

Vacuum Pressure—Vacuum incoming lines serving 3 to 6 substations each. Pressure outgoing line to each substation. Operated either by 1 or 2 low pressure, positive blowers or centrifugal compressors.



TYPICAL INSTALLATION PERRINE VACUUM PRESSURE PNEUMATIC TUBE SYSTEM

Automatic Pressure—Single tube for service in both directions between various stations. Equipped at each end with terminal, which automatically maintains air

flow only while carrier is in transit. Operated on a 1-lb. air pressure from special blower unit or by air reduced from high pressure air service.

Foot Power—Single tube for service in both directions between stations, with foot power operated compressor at each end. For light service and distances not exceeding 200 ft.

Sizes of Tubes—2¼-, 3- and 4-in. outside diameter tubing, and 3x6-in. and 4x7-in. oval tubing; except foot power, which is 2¼- and 3-in. outside diameter tubing only.

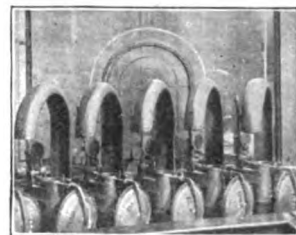
Power Saving Devices

For automatically cutting off air flow through the tubes when the carriers are not in transit. For both vacuum and pressure systems. They are extremely simple in construction and are most effective and efficient in operation and require the minimum of attention.

Installations

A few of many installations of Perrine Tube Systems are as follows:

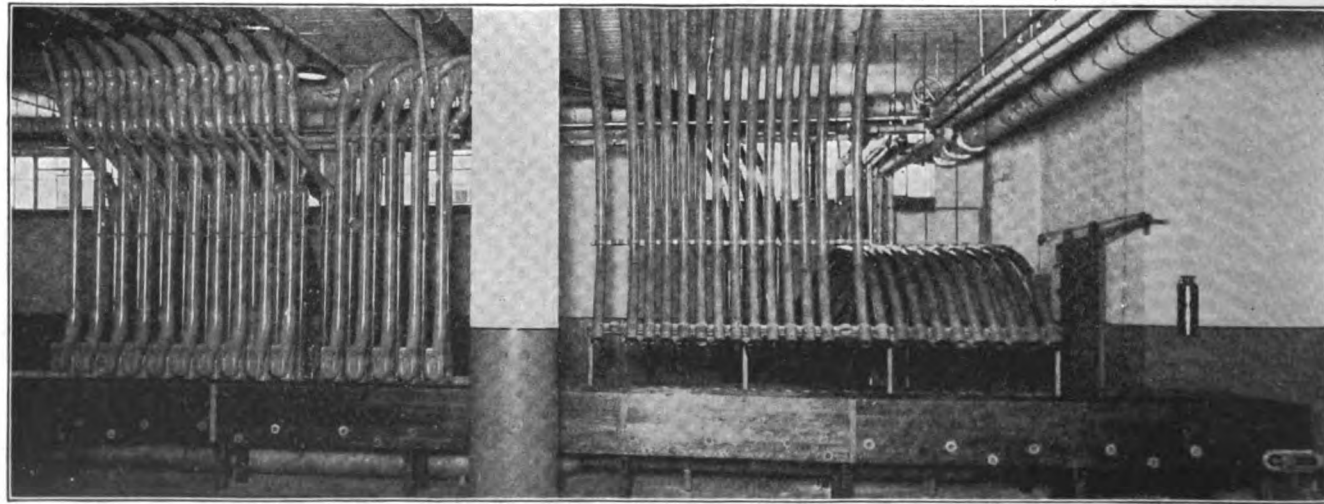
Armour & Co., So. St. Paul, Minn.
Swift & Co., So. St. Paul, Minn.
Swift & Co., Chicago, Ill.
Swift & Co., Los Angeles, Cal.
Morris & Co., Chicago, Ill.
Drake Hotel, Chicago, Ill.
Hotel Cleveland, Cleveland, Ohio
Washburn-Crosby Co., Minneapolis, Minn.
Powers Mercantile Co., Minneapolis, Minn.
L. E. Atkinson & Co., Minneapolis, Minn.
Minneapolis Journal, Minneapolis, Minn.
Minneapolis Daily News, Minneapolis, Minn.
The Golden Rule, St. Paul, Minn.
Schuneman & Evans, St. Paul, Minn.
Montgomery, Ward & Co., St. Paul, Minn.
Missouri Pacific R. R., Little Rock, Ark.



TERMINALS PERRINE AUTOMATIC PRESSURE PNEUMATIC TUBE SYSTEM



PERRINE POWER SAVING DEVICES



4-INCH PNEUMATIC TUBE SYSTEM WITH DOUBLE DOOR SILENT DELIVERY TERMINALS

Central station, Montgomery, Ward & Co.

KAESTNER & HECHT COMPANY

Electric Elevator Builders

1100 Blackhawk Street

CHICAGO, ILL.

BRANCH OFFICES

PITTSBURGH, PA.
CLEVELAND, OHIO

DETROIT, MICH.
OMAHA, NEBR.

BIRMINGHAM, ALA.
INDIANAPOLIS, IND.

MILWAUKEE, WIS.

MINNEAPOLIS, MINN.
ST. LOUIS, MO.

Products

ELECTRIC PASSENGER and FREIGHT ELEVATORS, with Car Switch or Automatic Control or both.

Also manufacturers of Electric Dumbwaiters and Hydraulic Lifts.

Experience and Responsibility

Since 1863 this organization has built fine machinery. At all times our policy has been just and generous dealings with those we serve; execution of contracts to their full intent and meaning; rigid adherence to that most important standard in elevator manufacture—safety.

Service

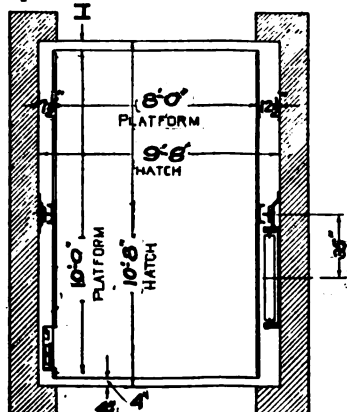
Intelligent engineering co-operation given architects, engineers and builders so that the elevator equipment best suited for their needs may be incorporated in plans and specifications. The practical value of our consulting service is shown by the many "change-over" projects we have successfully engineered. Prominent among these are:

Brandeis Building, Omaha, Nebr.
Chicago Athletic Association, Chicago, Ill.
First National Bank Building, Birmingham, Ala.
Hamilton Club, Chicago, Ill.
Tribune Building, Chicago, Ill.

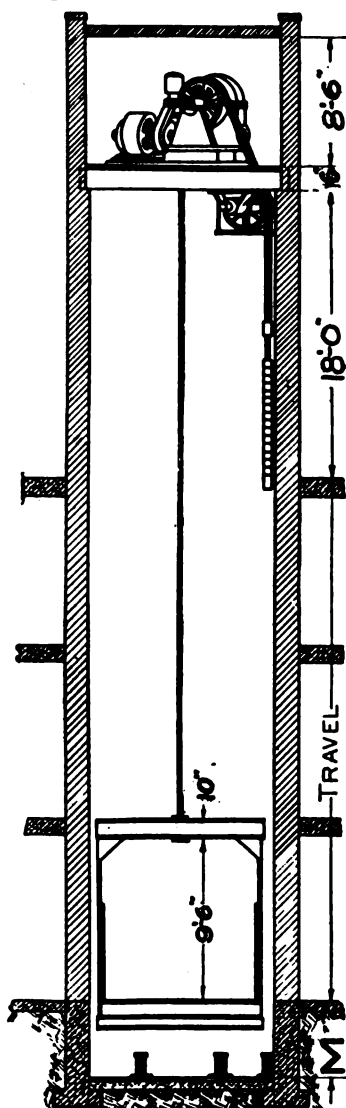
Typical Layout (see Diagrams)

Single gear traction freight elevator, capacity 6000 lbs., speed 100 f.p.m. For many industrial needs this is standard; and although platform area can be altered to meet exceptional conditions the loads, dimensions and clearances will remain the same.

This layout shows details which should be given in plans and specifications to secure type of equipment which will best serve requirements. No attempt made to employ practices other than those accepted by the American Society of Mechanical Engineers, and common in our experience.



— PLAN OF HATCH —



— SECTIONAL ELEVATION —

DIAGRAMS OF TYPICAL INDUSTRIAL INSTALLATION



TRADE-MARK

Information Desired for Estimates

Above material on all types of elevator equipment gladly sent to responsible parties. The following information is required when asking our estimate or counsel as outlined in paragraph Service:

Date information is wanted _____
Name and location of project _____
Name and address of owner _____
Architect _____ Engineer _____

Outline Specifications

Kind of service and operation _____
Capacity _____ Speed _____ Travel in feet _____
Travel in floors _____ Openings _____
Location of machine _____ Current _____
Size of hatch (P-W & F-B) _____
Size of platform (side post or corner post) _____
Number of cab sides enclosed _____

Literature

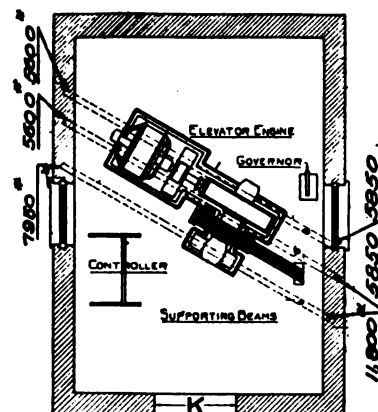
The following literature sent on request:

Electric Elevator Bulletin No. 500.
Dumbwaiter Bulletin No. 520.
Impact Load Chart.
Standard Elevator Dimension Bulletins, No. 1000 and No. 1001.
Automatic Door Lock and Switch Bulletin No. 1100.

Installations

Following is a partial list of K & H installations:

Delco Co., Dayton, Ohio
Dickinson Seed Co., Chicago, Ill.
Drake Hotel, Chicago, Ill.
Federal Reserve Bank Building, Cleveland, Ohio
Fort Des Moines Hotel, Des Moines, Iowa
Frost National Bank Building, San Antonio, Tex.
Kellogg Switchboard Co., Chicago, Ill.
Nordyke & Marmon Co., Indianapolis, Ind.
St. Paul Union Station, St. Paul, Minn.
Stewart-Warner Speedometer Corp., Chicago, Ill.
Stroh Building, Detroit, Mich.
U. S. Naval Base, Hampton Roads, Va.
Western Electric Co., Hawthorne, Ill.
Wrigley Building, Chicago, Ill.
Wrigley Factories, Chicago, Ill.



— PLAN OF PENTHOUSE —

MARSHALL BROTHERS CO.

Freight and Passenger Elevators

21st and Mary Streets, South Side
PITTSBURGH, PA.

Products

PASSENGER and FREIGHT ELEVATORS:
Electric, Hydraulic, Belt and Hand Power;
DUMBWAITERS.

Also, Sidewalk Lifts, Invalid Elevators and Telescopic Ash Hoists: Electric, Hydraulic and Hand Power.

Electric Elevators

Passenger Elevators—Controlled by car switch or push button. Designed for office buildings, residences, factories, apartments, etc.

Freight Elevators—Built in all sizes and capacities. Operated by car switch, push button or hand cable.

Our automobile electric elevators are specially designed for extra heavy duty.

Dumbwaiters—Electric dumbwaiters, operated by push button, made to suit any size hatchway.

Note: All of the above types of elevators are for alternating or direct current.

Hydraulic Plunger Elevators

For all water pressures and for freight purposes, as well as for dumbwaiter service.

Belt Power Elevators

Made for freight service where it is more desirable to use belts from main shaft or countershaft for driving power.

Hand Power Elevators

These are for use in stores, factories, residences, etc., where no electric or other power is available.

Special Types of Elevators

We also manufacture sidewalk lifts, invalid elevators and ash hoists, operated by electric, hydraulic or hand power.

MARSHALL ELEVATORS

TRADE-NAME

Construction of Marshall Elevators

All Marshall elevators are of the latest design. The safety features and equipment throughout are in full compliance with state and city elevator codes.

One of the safety features for preventing accidents through careless operation of the doors is our *electric contact and locks* so arranged that the elevator can not be moved while any door is open. No door can be opened unless the elevator is at the floor level. The opening of the door instantly locks the elevator at the floor and it can not be started until the door is closed and locked.

Our balance gate with electric contact is a special safety feature used on automobile and large freight elevator platforms.

The emergency switch is installed in all elevators having electric door contacts.

The safety governor exercises a positive control over the speed of our elevators in their descent.

We build freight elevators with steel platforms and steel guides, also with hardwood platforms and maple runways.

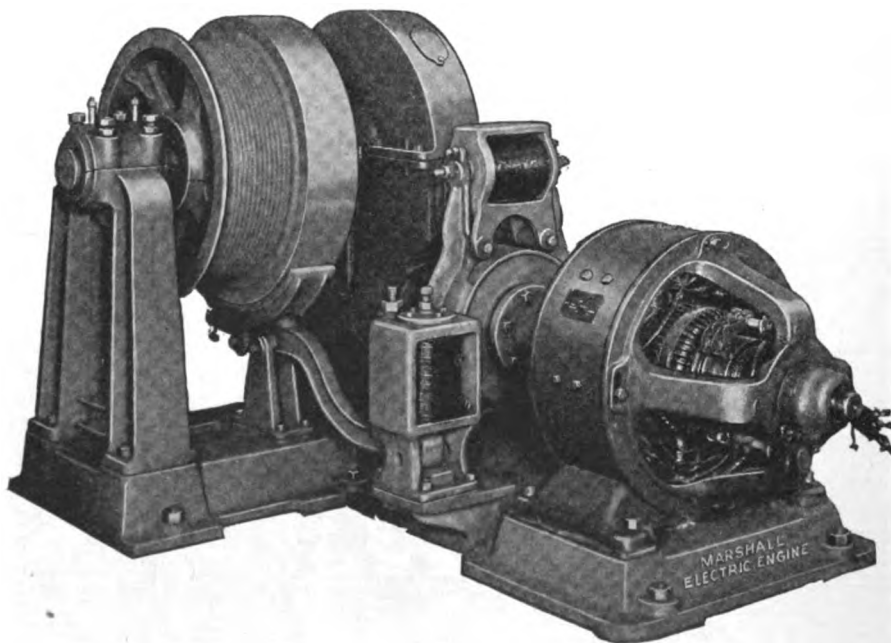
Data Required for Estimates

We will furnish on application our data sheets showing information required for making estimates.

Co-operative Service

We have been in business for many years and maintain a service department, enabling us to supply repair parts promptly.

We will gladly give to engineers, architects and owners the benefit of our experience in connection with the installation of all types of elevators.



DIRECT CONNECTED HEAVY DUTY ENGINE WITH SPECIAL ELECTRIC BRAKES

SEDGWICK MACHINE WORKS

Manufacturers of Hand Power Dumbwaiters and Elevators

TELEPHONE
WATKINS 9416

139 West 15th Street
NEW YORK, N. Y.

FACTORY
POUGHKEEPSIE, N. Y.

Products

HAND POWER ELEVATORS and DUMBWAITERS of all types and for every purpose:

Freight Elevators, Hatchway Hoists, Automobile Elevators, Ash Hoists, Sidewalk Hoists, Private House Dumbwaiters, Hospital Dumbwaiters and Elevators, Invalid Elevators, Gravity Drops.

Special Outfits to meet special needs.

Special Features of Sedgwick Products

Long life, easy operation, freedom from trouble, low repair cost; all the result of superior design and principle, executed from the best of materials by skilled workmen in a factory devoted exclusively to the manufacture of hand power dumbwaiters and elevators, and equipped with special machinery for this purpose.

Quantity production on the interchangeable part system guarantees a uniformly high grade product.

Hand Power Elevators

Made for any service, in any size, and for any capacity. Complete outfit includes machine, car, counterweight, guide runs, ropes, and cables.

Furnished with automatic hatch doors and self-closing gates, if desired.

Dumbwaiters

A large number of standard sizes are carried in stock. Special sizes and types can be supplied to meet any conditions.

Deliveries

Catalogue sizes are carried in stock, and shipment is made the day order is received.

Special sizes and types to meet individual requirements on short notice.

Installation

Proper installation is essential to satisfactory operation.

Blue prints and full directions for installing are furnished with each outfit, from which local labor may install. Or experienced mechanics will be sent by the company to install on request.

SWEET'S CATALOGUE

Sedgwick Service

Complete satisfaction depends on the selection of dumbwaiters or elevator outfits exactly suited to the conditions and requirements of each case. Sedgwick service places at the disposal of engineers and others, without charge, the benefit of specialized experience of more than 25 years. The Service Department will work with engineers in deciding on the proper dumbwaiter or elevator equipment to give specific results under specific conditions.

Special Outfits

Thousands of special drawings and designs have been developed, during a long experience, for special purposes.

Special construction can be furnished on very short delivery, without sacrifice of quality and with the usual guarantee.

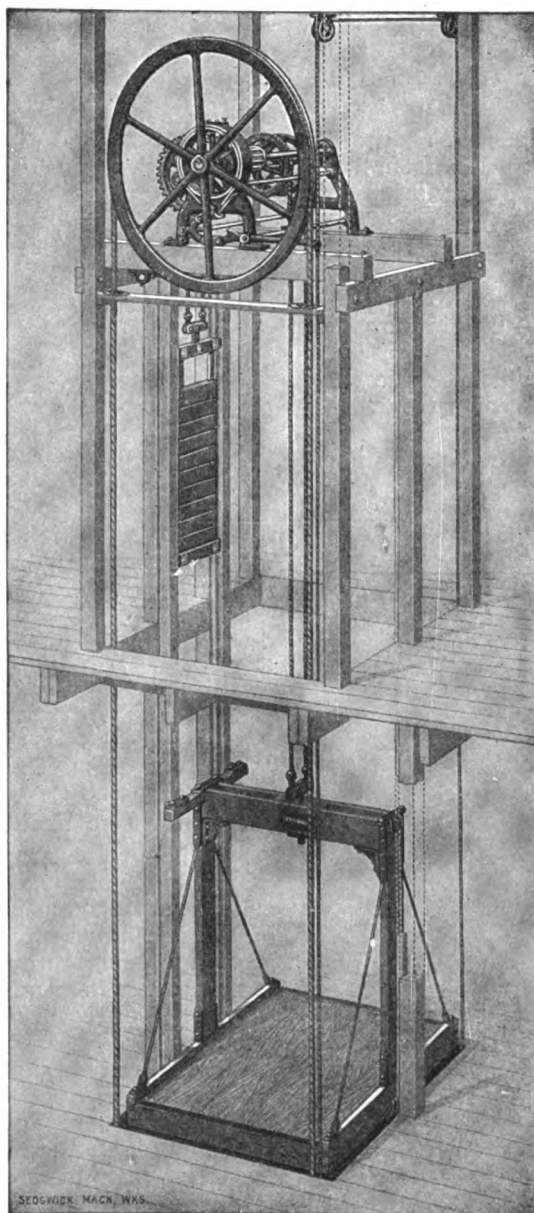
Catalogue

Complete catalogue sent on request.

Installations

A few installations of Sedgwick equipment:

American Bank Note Co.
American Blower Co.
American Car & Foundry Co.
American Cigar Co.
American Cotton Oil Co.
American Druggists Syndicate
American Lead Pencil Co.
American Railway Supply Co.
American Sugar Refining Co.
American Tobacco Co.
Atlas Powder Co.
The Bush Terminal
Cadillac Motor Car Co.
Childs Restaurant Co.
Diamond Rubber Co.
Eastman Kodak Co.
Edison Phonograph Works
Fleishman Co.
General Chemical Co.
General Motors Truck Co.
Goodrich Tire & Rubber Co.
Kirkman Soap Co.
S. S. Kresge Co.
Louis K. Liggett Co.
T. J. Lipton Tea Co.
The Lily Cup Co.
National Biscuit Co.
National Cash Register Co.
National Twist Drill & Tool Co.
N. Y. Central & Hudson River R. R. Co.
N. Y. Edison Co.
N. Y. & N. J. Telephone Co.
Packard Motor Car Co.
Pennsylvania R. R. Co.
Smith Premier Typewriter Co.
Standard Oil Co.
Toledo Shipbuilding Co.
U. S. Ordnance Department
U. S. War Department
Western Clock Mfg. Co.
F. W. Woolworth Co.
Timkin-Detroit Axle Co.



SEDGWICK HAND POWER ELEVATOR

JOHNSTON MANUFACTURING & SUPPLY CO., INC.

Automatic Elevator Door Sills; Fire Resisting Paints

TELEPHONES
FRANKLIN 5392
MAIN 2484

208 North Wells Street
CHICAGO, ILL.

Products

ARNOLD AUTOMATIC ELEVATOR DOOR SILL.
The JOHNSTON "FUROLIN" FIRE RESISTING PAINTS
and LIQUIDS.

Arnold Automatic Elevator Door Sill

A perfect automatic trucking device used in conjunction with Meeker or Peelle doors.

Illustrations show the sill on closed door, and in position when open, bridging the space between the elevator cab and building floor.

The sill is attached to the lower half of the elevator door and moves up and down with it, automatically, assuming the position required.

Advantages—Eliminates broken truck wheels.

Eliminates broken merchandise.

Eliminates broken doors.

Eliminates loss of time waiting for hand plate to be laid down before trucking on or off. *It is fully automatic.*

Guaranteed to repeatedly save its cost. It protects the door from being jarred; prevents it from being opened when elevator is not in place. *Saves time, repairs and prevents accidents.*

Causes increased efficiency in handling merchandise. Increases profits.

Testimonials—

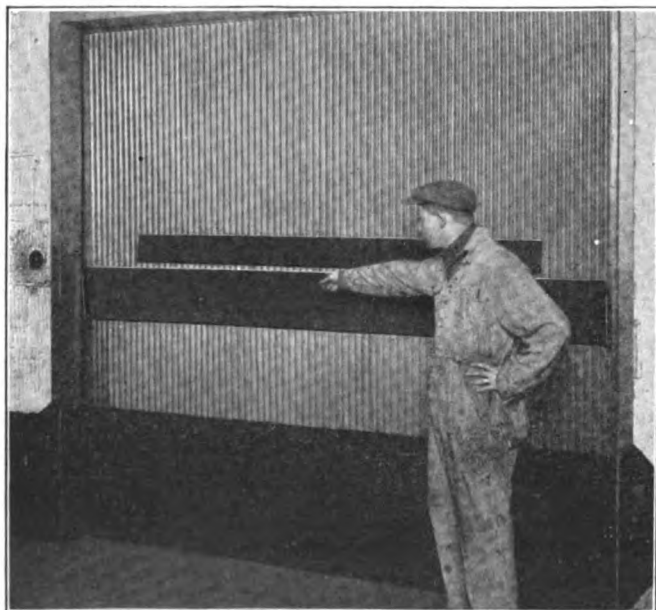
BOYNTON WOOL SCOURING Co.—"Big improvement over old methods used."

ELMER RICHARDS Co.—"Very satisfactory service."

GRISWOLD & WALKER, INC.—"Very satisfactory—have several and intend to install more."

LYON & HEALY—"Saves heavy lifts between floors and elevators."

MOSER PAPER Co.—"Have 18 in use—practical and satisfactory."



INSTALLATION OF ARNOLD AUTOMATIC ELEVATOR DOOR SILL
SHOWING DOOR CLOSED

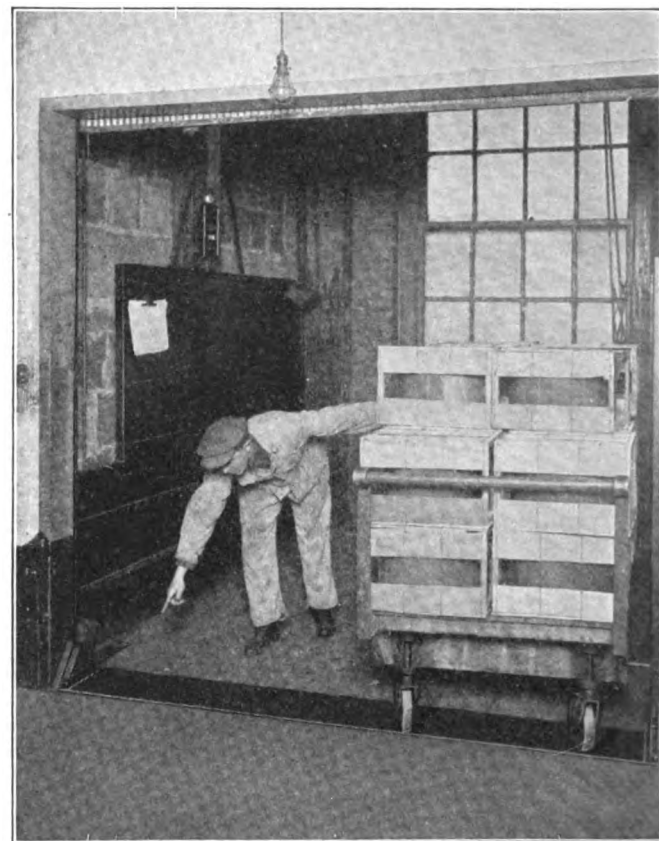
GEO. RASMUSSEN Co.—"Satisfied—put them in two buildings."

SOUTHERN COTTON OIL COMPANY—"Most efficient device of its kind."

UNION BAG & PAPER CORPORATION—"14 in use; don't know how we could get along without them."

WILSON BROTHERS—"Expedites the work of the truckers."

WHITE-STOKES Co.—"Has paid for itself many times—prevents containers falling off."



INSTALLATION OF ARNOLD AUTOMATIC ELEVATOR DOOR SILL
SHOWING DOOR OPEN

"Furolin" Fire Resisting Paints

These paints are for interior and exterior use, and while doing all that any good paint will do, at the same time protect permanently the surface covered from carrying flames when applied thereto. Made in various grades and colors, at no higher prices than for paints offering no such protection.

Fire resisting paints made under the Johnston formulas are in use by more than 30 railroads, besides lumber mills and corporations throughout the country, and have been for more than ten years. We are the exclusive manufacturers. Full information on request.

"Furolin" paints are the strongest, most effective fire resisting paints in the world.

FUROLIN
FIRE CEASES TO BE
TRADE-MARK

AMERICAN PROCESS COMPANY

Manufacturers of Drying, Pressing and Cooking Machinery

68 William Street
NEW YORK, N. Y.

Products and Services

DRYERS; PRESSES; DIGESTERS and COOKERS.

Complete drawings and directions are always furnished for the erection and operation of dryers and, generally, no outside assistance is required. Recommendations made and, if desired, an engineer will be placed in charge of the installation.

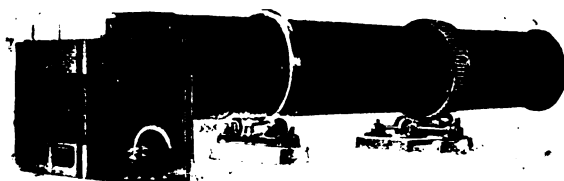
American Process Machinery

Distinguishing Features—The distinguishing features of AMERICAN PROCESS COMPANY'S machinery are its automatic, continuous and uniform action.

Advantages—(1) Product is uniform; (2) labor is reduced to a minimum; (3) wear and tear of starting, stopping and reversing or otherwise changing the load are eliminated, thus prolonging life of machine far beyond that of similar types; (4) economy in fuel consumption, heat being applied direct; (5) saving in power and increase in capacity by continuous action.

Dryers

The dryers manufactured by AMERICAN PROCESS COMPANY will handle any kind of animal, vegetable and mineral materials, organic or inorganic matter, solid or liquid. They are operated either by direct heat or steam heated air.



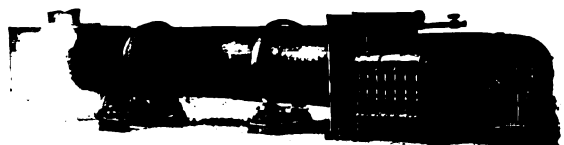
SAND, ORE AND FERTILIZER DRYER

Direct heat rotary dryer, with gear ring. Materials and gases travel in same direction. Wet material and furnace gases enter shell together at higher end. Wet material falls to bottom of shell, is caught by an interior shelf, elevated to almost highest point of rotation, and then falls again through furnace gases. This operation, with highest temperature in contact with wettest material, continuous until dried material is discharged through lower end of dryer. Dryer with furnace can be erected by any competent mechanic.

DRYER CAPACITIES AND DIMENSIONS

No.	Capacity (lbs.) sand, ore, etc., per hour, when 5% moisture	Capacity (lbs.) of fertilizer, etc., when 50% moisture	Horse-power	Shipping weight, lbs.	Floor space
C II	10,000	1,000	5-8	10,000	27' 6"x6'x6' 6"
C III	20,000	2,000	8-12	12,000	32' 6"x6'x6' 7"
C IV	30,000	3,000	10-15	15,000	37' 6"x6'x6' 7"
C V	40,000	5,000	15-20	28,000	42' 6"x9'x8' 9"
C VI	50,000	8,000	20-25	30,000	50' 6"x9'x9'

Counter current dryers and brick lined roasters are also manufactured.



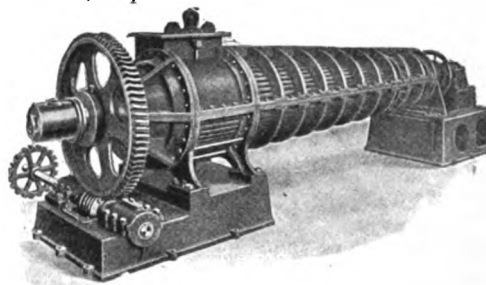
STEAM HEATED AIR DRYER

For drying borax, baking powder, nitrate of ammonia, etc.

Automatic Continuous Screw Presses

Automatic continuous screw presses of different construction, used for separating any solid matter from its liquid, can be adapted for slaughter house tankage (residuum of fats) as well as for pressing fish and reclaimed rubber.

The press illustrated below is self-contained and of continuous screw type, consisting of a horizontal tapered screw built up on a hollow perforated shaft and arranged to allow admission of steam, if desired. Screw fits closely inside of a similarly tapered slatted curb, and rotates. Material, forced into conveyor portion of screw, then into curb, must move towards small end of press as screw turns. Size of discharge opening is regulated. Drainage is both internal and external. To regulate supply of material, a patented feeder is furnished.



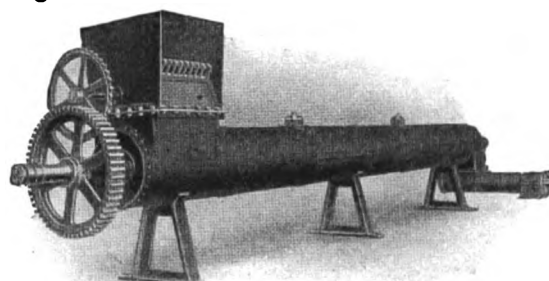
CONTINUOUS SCREW PRESS

Material fed in at one end and discharged at the other; liquids forced out between slats and into drainage holes of shaft, thence to a tank. Built in all sizes.

Automatic Continuous Digesters and Cookers

These are of the direct steam, self-contained type and are operated continuously. A screw conveyor (inside a cylindrical shell) rotates, cuts up, digests and thoroughly agitates material and carries it forward. Steam admitted through perforations in hollow shaft of conveyor. Note forced rotary feed at admission end. Liquid and solid matter are discharged together, thence to a tank. Drainage tank can be built at small expense.

Digesters and cookers to meet all conditions.



AUTOMATIC CONTINUOUS DIGESTER AND COOKER

Feed, digester proper and discharge all driven by sprockets and chain belting. Very little vibration, and digester can be erected in upper stories of building. Built in all sizes.

Information Required for Estimates on Dryers

Kind and nature of material to be dried; preliminary treatment which material has undergone, if any; average moisture; size of pieces; amount of wet material to be dried per hour; limit of moisture desired in dried material; kind of fuel to be used; where dryer is to be located; present method of drying.

THE BIGGS BOILER WORKS COMPANY

ESTABLISHED 1887

Vulcanizers, Devulcanizers and Bleaching Boilers

East Market Street and Case Avenue

AKRON, OHIO

Products

VULCANIZERS and DEVULCANIZERS with "SIMPLEX" BOLTLESS QUICK CLOSING DOORS.

GLOBE and CYLINDER ROTARY BLEACHING BOILERS. Also, Rubber Vulcanizing Heaters; Transfer Cars; Creosoting Tank Cars; Brick Furnaces; Incinerators; Autoclaves; Digesters; Kiers; Kettles: Chemical Process, Galvanizing and Tar Melting; Dryers: Steam Heated Rotary Air, Direct and Indirect Heat and Atmospheric Rotary; Rubber Machinery; Paper Mill Machinery; Paint Making Machinery; Sugar Plantation Equipment.

For Tanks and other Steel Plate Construction, see page 462.

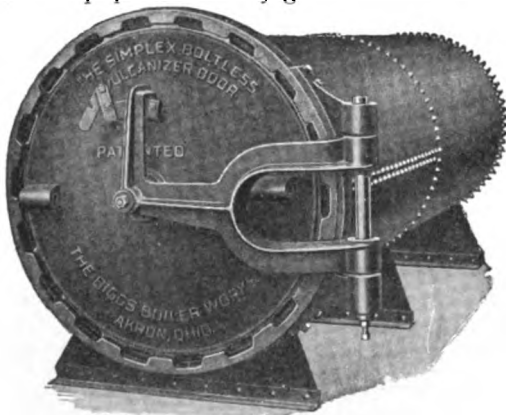
"Simplex" Boltless Quick Closing Vulcanizer Door

Made throughout of high grade cast steel, accurately machined and entirely self-contained. No mechanical operating device required. Extremely heavy in construction. Satisfactory for vertical or horizontal vulcanizers, or similar equipment. Door is tight when used at specified operating pressure *without using fastening bolts* of any description.

Even the larger sizes can be opened or closed in 30 seconds without using any mechanical leverage other than short bar inserted in lugs provided. Practically no upkeep.

The design and construction of the "Simplex" has been accepted by the insurance companies, and will be accepted by them for insurance. Certificate of inspection furnished, if desired.

Furnished in sizes as large as 10-ft. diameter. Ideal door for creosoting cylinders, brick hardening cylinders and similar equipment. Fully guaranteed.



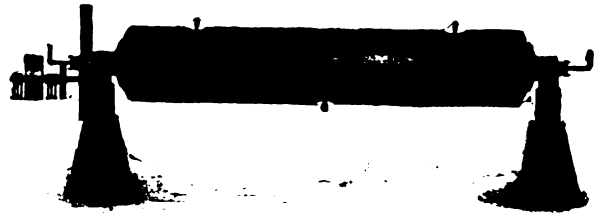
"SIMPLEX" BOLTLESS HEAD ON A STANDARD HORIZONTAL VULCANIZER

Jacketed Vulcanizers

Used very largely for special work where a dry heat is desired and steam is not permitted to come in contact with material to be treated. These vulcanizers are rigidly constructed. On sizes larger than 42 in. in diameter, entire collapsing strain of inner shell is thrown on to staybolts. Steam jacket extends around entire shell and rear head (all sizes).

Jacketed Rotary Devulcanizers

With the jacketed rotary devulcanizer, material to be devulcanized is placed in inner chamber containing the liquid, steam is admitted to jacket, and the entire devulcanizer is revolved continuously, and agitation assisted by stationary angles.



ROTARY DEVULCANIZER

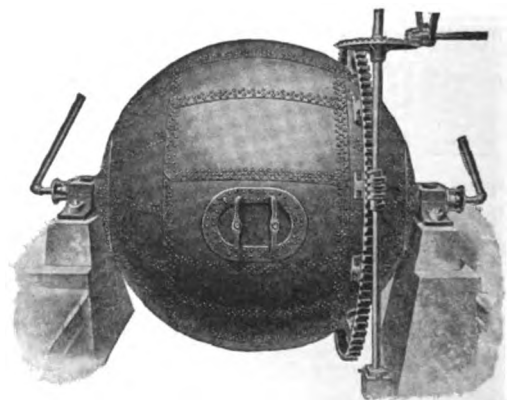
Machines are ordinarily constructed for 125 to 150 lbs. steam working pressure on the jacket, which should produce a temperature of approximately 350° to 365° Fahr. Made in all sizes and for any pressure. Furnished with inspection certificate issued by the insurance companies, which will be accepted by them for insurance.

This company also furnishes stationary horizontal or vertical devulcanizers, having a central shaft containing paddles, which do the agitating.

Special Apparatus—The experience of this company, together with special equipment and facilities, places it in position to furnish specially designed vulcanizers, devulcanizers, and special steel plate construction up to 1½-in. thickness of material. Plant hydraulically equipped.

Rotary Bleaching Boilers for the Paper Trade

This company has manufactured globe and cylinder rotary bleaching boilers for the paper trade since 1887, and has installed its products in the majority of the leading paper mills in the United States, Canada and foreign countries. An assortment of standard drives can be furnished for either type of bleaching boiler. Biggs rotaries are made in all sizes, for all requirements and are guaranteed absolutely.



GLOBE ROTARY BLEACHING BOILER
For strawboard mills, pulp mills, etc.

L. R. CHRISTIE COMPANY

Manufacturers of Dryers, Calciners and Roasters

501 Peoples Bank Building
PITTSBURGH, PA.

NEW YORK, N. Y., 50 Church Street

WORKS
Galveston and Behan Streets

LOS ANGELES, CAL., Bradbury Building

Products

ROTARY DRYERS; CALCINERS, ROASTERS, and CONTINUOUS RETORTS.

CHRISTIE
DRYERS · CALCINERS · COOLERS
TRADE-MARK

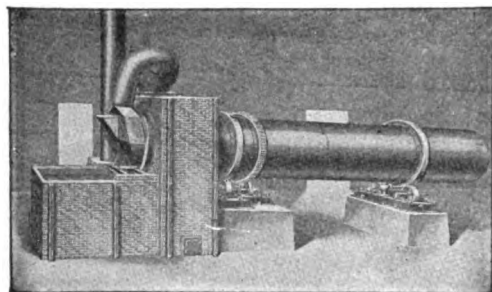
heating surface is essential in this type, we use the enclosed setting so as to utilize the outside shell and also provide heat ducts throughout the interior, which are designed to give a maximum amount of surface per size of unit. An efficient and economical arrangement.

Types of Dryers

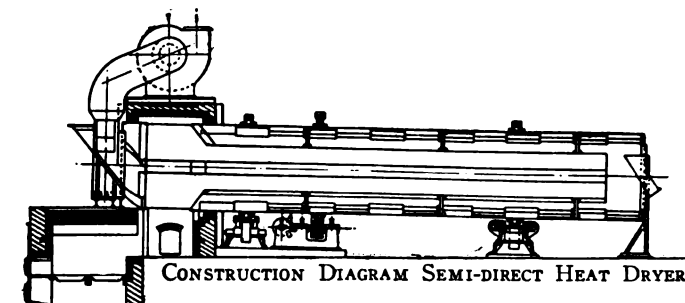
L. R. CHRISTIE COMPANY manufactures every type of rotary dryer. Certain types have been improved and perfected to the very highest degree of efficiency. Chief among these are the semi-direct heat dryer, the indirect heat dryer, the air absorption dryer and the steam tube dryer.

Semi-direct Heat Dryer

An internal heat flue type having a central flue of exceptionally large surface for the required area, through which the gases first pass, giving up their heat to the



SEMI-DIRECT HEAT DRYER

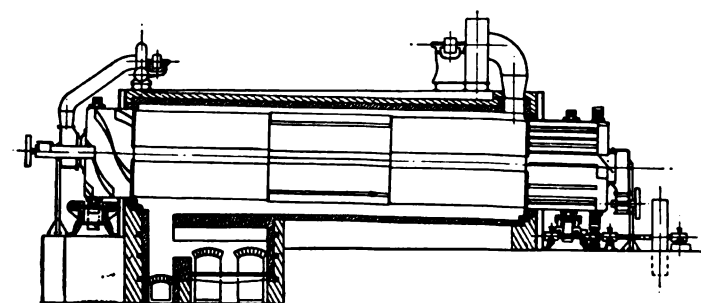


CONSTRUCTION DIAGRAM SEMI-DIRECT HEAT DRYER

surrounding material and later passing directly through material in counter-direction, effecting great economy of fuel, installation and operating expenses.

Indirect Heat Dryer

In this dryer, the hot gases are not permitted to come in contact with the material being dried. As large



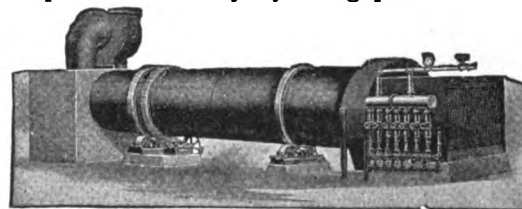
CONSTRUCTION DIAGRAM INDIRECT HEAT DRYER

Semi-indirect Heat Dryer

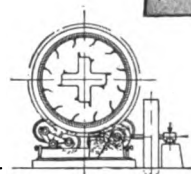
External application of high temperature gases permits drying organic or combustible materials, without case hardening or igniting. A central tube returns the low-temperature gases to the feed end where they mix with the material and flow concurrent to the discharge end, giving a superior grade of product and efficient operation.

Air Absorption Dryer

When necessary to dry at low temperatures, this may be accomplished efficiently by using preheated air



AIR ABSORPTION DRYER



to absorb the moisture, heat being supplied by steam coils or other means at either end, or steam tubes may be enclosed within the drying cylinders.

Calciners, Roasters, and Direct Heat Dryers

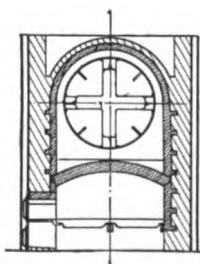
For high temperature work, driving off combined gases, water of crystallization or for rough drying and burning out foreign matter.

Provided with refractory lining, spraying flights or a combination, as conditions require, hot gases passing directly through the material.

Services

Twenty-three years of specialized effort in designing and operating drying machinery have been responsible for these advanced models. They are not untried experiments. Their marked economy, made possible through many improvements over old types of dryers, recommends them immediately to the discriminating buyer.

Inquiries should state all requirements as fully as possible.



J. P. DEVINE CO.

Manufacturers of Apparatus for the Chemical and Allied Industries

1375 Clinton Street
BUFFALO, N. Y.

BRANCH OFFICES

NEW YORK, N. Y., 50 East 42nd Street

HAVANA, CUBA

LONDON, ENG., JAS. LIVINGSTON, LTD.

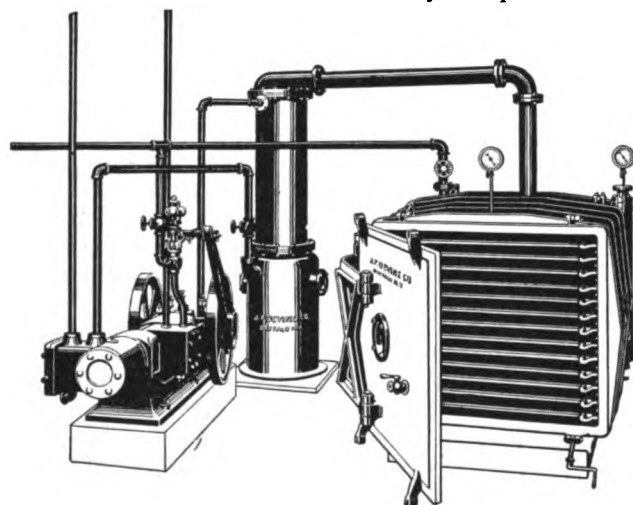
Products

VACUUM CHAMBER DRYERS; VACUUM DRUM DRYERS; VACUUM ROTARY DRYERS; IMPREGNATING APPARATUS; NITRATING, REDUCTION, SULPHONATING and FUSION KETTLES; AUTOCLAVES; EVAPORATORS; VACUUM PANS; VACUUM PUMPS; ROTARY VACUUM PUMPS.

Also manufacturers of Solvent Recovery Apparatus, Acid Eggs, Acid Retorts, Beta Naphthol Stills, Caustic Pots, Columns, Crystallizing Pans, Digestors, Distilling Apparatus, Extractors, Logwood Extract Plants, Wood Distillating Plants, Sand Dryers, Fertilizer Apparatus, Steam Jacketed Pipes and Valves, Percolators, Vulcanizers, Washers, Defecators, Crystallizers, Filter Presses and other Apparatus for the Sugar Industry, Special Apparatus

Vacuum Chamber Dryers

This chamber dryer is designed for handling all materials that can be handled on trays or pans.



DEVINE VACUUM CHAMBER DRYER WITH SURFACE CONDENSER AND VACUUM PUMP

For colors, dyes, extracts, salts, rubber, smokeless powder and high explosives, and other chemicals and food products. Materials which are difficult to dry in the atmosphere without decomposition can be handled rapidly and efficiently in this type of dryer without any danger of impairing their qualities. Vacuum drying chamber is designed to remove water rapidly and at a low temperature, assuring uniform drying and low operating cost.

Ask for Bulletin 101 on this subject.

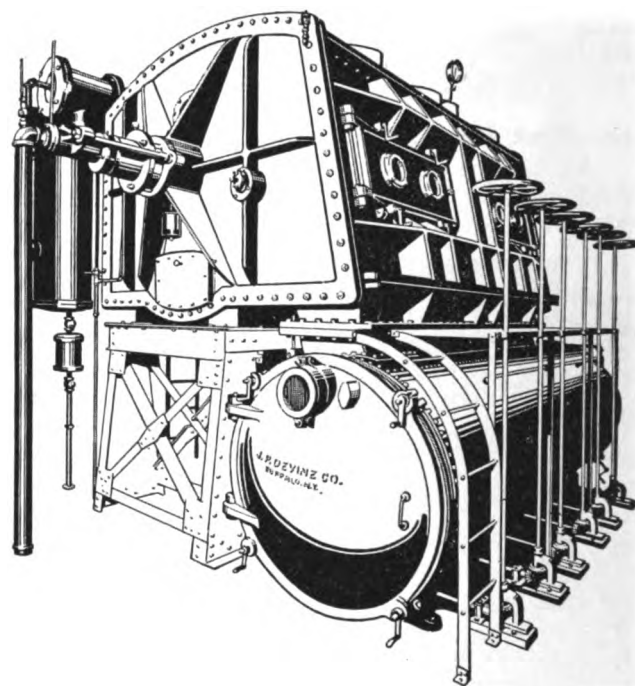
Vacuum Drum Dryers

This drum dryer is designed for handling all solutions containing solids, drying same to a powder.

For dyewood and tanning extracts, milk and food products, pastes, etc. This type of machine affords a rapid and uniform drying, because the drum takes up but a very thin film of wet material. Water is then evaporated from material, leaving dried substance on

drum to be taken off by our improved method. Drying process is continuous and independent of climatic conditions, free from dust, and is uniform.

Fully described in Bulletin 102.



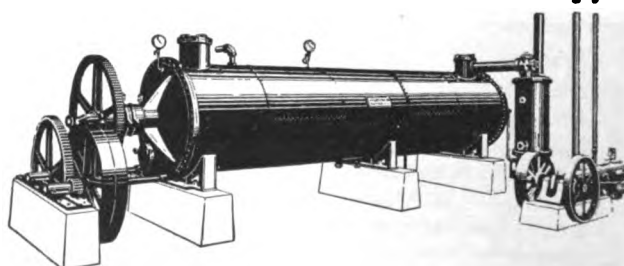
DEVINE VACUUM DRUM DRYER

Vacuum Rotary Dryers

For materials that can be mixed or tumbled in the drying.

For starch, granular substances and chemical products. Moist material is charged into dryer and by means of a high efficiency dry vacuum pump and condenser, furnished as part of the unit, a high vacuum is produced, the vapor being pulled over into the producer and condensed. Concentric with steam jacketed outside cylinder is a revolving drum, heated by live exhaust steam, to which the stirring blades are attached. Material to be dried is between outside drum and inside cylinder, kept in constant motion by stirring blades.

Ask for Bulletin 103.



DEVINE ROTARY VACUUM DRYING APPARATUS

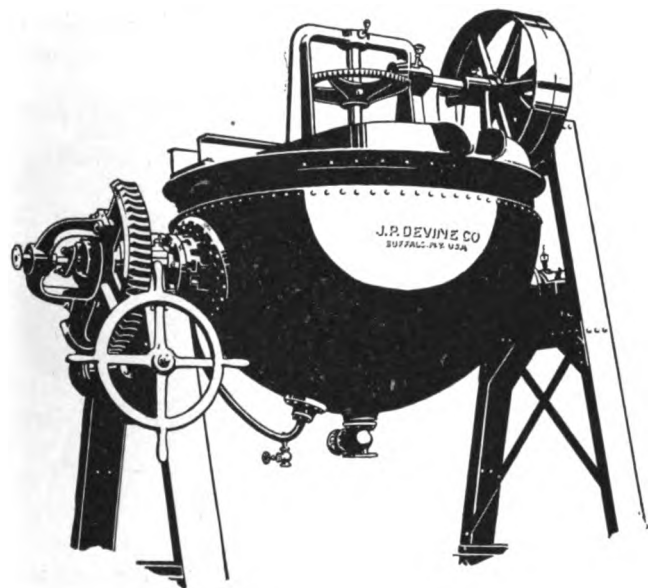
Impregnating Apparatus

For armature, field, magnet and transformer coils, power and telephone cables, piano sharps, pencil slats and other wood products, leather fabrics, cotton or cord tire fabrics with rubber compound, etc. This is a combination vacuum drying and impregnating apparatus, the coils or material to be handled first being dried under vacuum, thereby removing both air and moisture from interior as rapidly as from surface. Compound is then drawn into impregnating tank and penetrates to innermost recesses of material; and to render this penetration more thorough, air at artificial pressure is admitted into impregnation tank above surface of compound.

Ask for Bulletin 104.

Nitrating, Reduction, Sulphonating and Fusion Kettles

All sizes and capacities for every requirement. Built with or without stirring device, and supplied with



DEVINE CHEMICAL KETTLE

or without reflux condensers. Also arranged for heating with fuel oil, gas, steam or water jacketed.

Nitrating kettles built with large cooling surface, powerful stirring device. Reduction kettles, combination rake stirring device, internal renewable cast iron slabs.

Ask for Bulletin 105A.

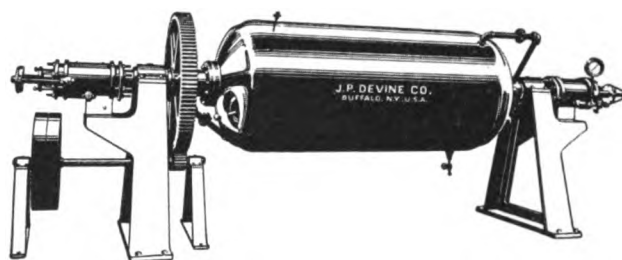
Autoclaves

Sizes range from 1/4-gal. to 300-gal. capacities; for working pressures up to 1000 lbs. per sq. in., with or without stirring device. High pressure autoclaves are made of cast steel, and low pressure autoclaves of cast iron, copper or bronze. Provision made for heating. Every autoclave is fitted with cover with all necessary openings, pressure gage, safety valve, thermometer tube, etc.

Carbonators

The rotary carbonator is constructed of sheet steel with all joints welded, and it is designed to work satisfactorily both under high pressure and high vacuum. Hollow trunnions permit steam, air, or gas being introduced or removed from the interior.

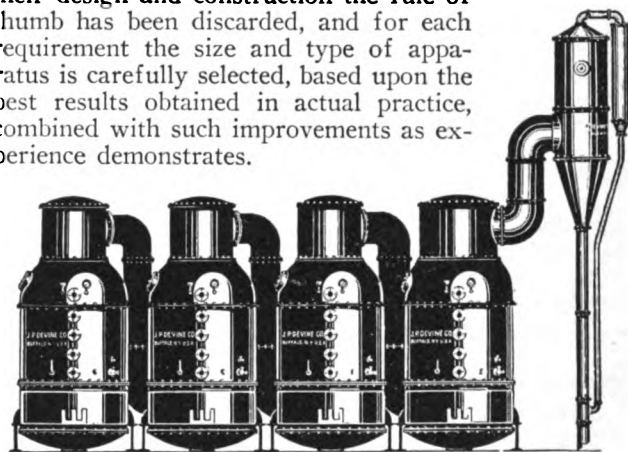
This apparatus is very versatile and can be adapted to five distinct operations: mixing, concentrating, drying, grinding and carbonating.



DEVINE ROTARY CARBONATOR

Evaporators and Vacuum Pans

Single and multiple effect units of all sizes and capacities of cast iron, sheet steel, copper, etc. These vacuum evaporators and pans are designed to insure maximum efficiency at a minimum cost of operation. In their design and construction the rule of thumb has been discarded, and for each requirement the size and type of apparatus is carefully selected, based upon the best results obtained in actual practice, combined with such improvements as experience demonstrates.



DEVINE QUADRUPLE EFFECT VACUUM EVAPORATOR

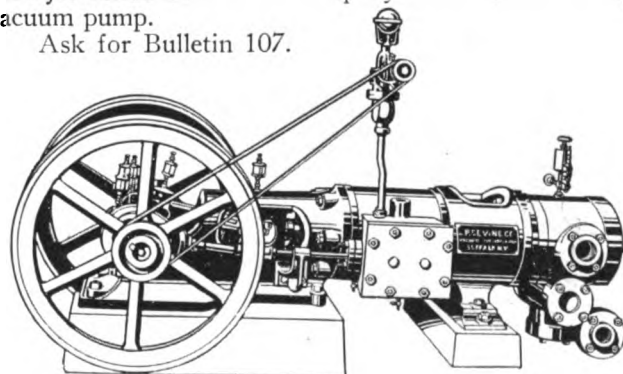
In the construction of Devine evaporators great stress is laid on securing the most rapid and intense circulation of the liquors, as only by such a circulation can all particles of the liquid come in contact with the heating surface, thus securing the quickest concentration without overheating the material. Special care is likewise given to metal of which the heating tubes are to be constructed, as well as to the lining, to resist acids and to prevent incrustation.

Ask for Bulletin 106.

Vacuum Pumps

The vacuum pumps which are furnished with the vacuum apparatus are constructed in two principal types, the dry vacuum type and the wet vacuum type. The dry vacuum type is built with either rotary valve or slide valve, and also in single- or two-phase. The rotary valve type is recommended where large capacity of air is required. The wet vacuum pump is furnished with jet condenser. This company also builds a rotary vacuum pump.

Ask for Bulletin 107.



DEVINE VACUUM PUMP

HAMLER BOILER & TANK CO.

Designers, Fabricators and Erectors of Steel Plate Construction and Chemical and By-product Equipment

6700 South 60th Avenue
CHICAGO, ILL.

Products

DRYERS: Rotary, Indirect and Direct Heat, Vacuum, Jacketed, and Agitator Types.

RIVETED and WELDED STEEL TANKS for every purpose including Light Gauge Oil Storage, Underground, Pressure; Ice and Brine Tanks, and Tower Tanks.

STEEL PLATE CONSTRUCTION including Boilers, Boiler Breechings, Self-supporting Smokestacks, Riveted and Welded Steel Pipe, etc.

Also Chemical Apparatus including Retorts, Evaporators, Stills, Bleaching and Mixing Kettles, Agitators, Jacketed Kettles, and Roofing Machinery.

Organization and Facilities

Industrial engineers the world over have come to learn that this organization can co-ordinate its knowledge and ability to fit the most exacting requirements of the chemical and by-product industries.

Write for catalogues which cover the different specifications of work in the chemical industry.

Hamler Corrugated Agitator Type Dryer (Patented)

Designed for drying or cooking under vacuum or pressure. It is of the horizontal agitator type, utilizing steam for drying, the steam being contained in a jacket surrounding a corrugated cylindrical shell. A power driven agitator keeps mixture in circulation and

HAMLER
CORRUGATED
FERTILIZER DRYERS

TRADE-MARK

affords a large surface exposure to the material being dried.

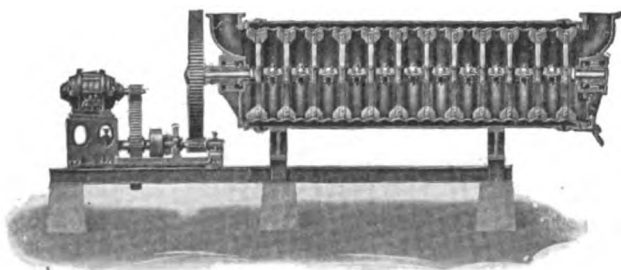
Scope of Use—Below is a partial list of products efficiently dried in the Hamler corrugated dryer:

Fertilizer	Guano	Soap powder
Animal tannage	Sheep manure	Dextrine
Blood	Fish scrap	Starch
Garbage	Chemical salts	Glucose
Wood pulp		Leather scraps

Analogous products and where drying under vacuum is necessary.

Predominant Features—No staybolts are used, thus the inner shell is free from openings or projections, no leakage of steam is possible and the mechanical inefficiency of the staybolted type has been overcome.

It dries twice as fast as the staybolted type, and in half the time, operates continuously without extensive repairs and requires no additional labor to operate.



HAMLER CORRUGATED FERTILIZER DRYER
Three sizes: 5x16, 4x12 and 3x10 ft.

No heat losses through radiation; less power is used due to the elimination of friction losses.

It is impossible for the material being dried to bake to the shell.

Shipped ready for installation and does not require the services of expert erectors. We will supply competent erecting crews, if desired.

Direct or Indirect Heat Dryers

Direct or indirect rotary kilns built in any size to suit purchasers' specifications. This type of dryer is most adaptable to the drying of:

Coal	Garbage	Ammonia sulphate
Sand	Salt	Potash salts

We build these dryers complete with or without furnace or dust collectors.



HAMLER DIRECT HEAT DRYER

Steel Tanks

Hamler Station or Storage Tanks—Vertical and horizontal types for gasoline and oil distributing stations or storage of liquids. Made of open hearth steel, hot riveted, and calked throughout. Necessary flanges and openings furnished for standard pipe connections. Horizontal tanks furnished with either flat or dished heads.

Carefully tested, absolutely tight, and purchaser is furnished with a certificate of inspection.

Standard stock sizes meet practically every existing condition and are available for immediate delivery.



STATION OR STORAGE TANK

Steel Tanks for Other Purposes—We fabricate and erect riveted or welded steel tanks for any purpose, of either standard or special designs. Inform our engineers of the requirements and they will submit specifications and estimates.

Steel Plate Construction

The services of a most efficient and well equipped plant is at your command for steel plate work of every description from our designs or your specifications. Exceptional shipping facilities. Consult our engineers without obligation.

ESTABLISHED 1893

RUGGLES-COLES ENGINEERING COMPANY

Designers and Builders of Dryers for All Materials

120 Broadway
NEW YORK, N. Y.

BRANCH OFFICE, Newhouse Building, SALT LAKE CITY, UTAH
WORKS: YORK, PA.

Products

RUGGLES-COLES DRYERS for drying by means of Direct Heat, Indirect Heat, or Steam.

Special Dryers constructed for materials having unusual characteristics.

Class "A" Dryer—Double Shell Direct Heat

This dryer is now the standard type for drying coal, coke, ores, rock, stone, sand, concentrates, and similar materials. The temperature for drying ranges between 220° and 400° Fahr., depending on the material to be dried. This dryer is built in seven standard sizes.

Operation—The gases of combustion pass from the furnace into the inner cylinder of the shell and then pass back in the annular space between the two cylinders. The gases of comparatively high temperature entering the inner flue are introduced by the transfer of the heat through the inner shell to the material resting thereon during part of the revolution. Upon leaving the inner cylinder, the gases turn back, passing through the cascading material. The gases passing out through the exhaust fan are approximately 150° Fahr. The rotation of the shell automatically showers the material through the gases and places it on top of the hot inner shell. The material slowly works its way through the dryer, since the discharge end is slightly lower than the feed end.

Class "B" Dryer—Double Shell Indirect Heat

This type is especially adapted for drying china clays, talc rock, whiting, kaolin, and those materials which can be dried at fairly high temperature but must not come in contact with the products of combustion due to possible injury or contamination.

Operation—

This dryer operates in a similar manner to the Class "A," with the exception that the gases of combustion after reaching the rear end of the

inner flue return in ducts or tubes attached to the inside of the outer shell and are then drawn out by the fan. These ducts act as the lifter vanes for showering the material being dried.

Class "C" Dryer—Rotary Steam

There are many materials which can not be dried by direct heat or even indirect heat, due to high temperatures causing injury to the material; hence a Ruggles-Coles steam dryer has been developed to handle such materials as brewers' grains, cotton seed, starch feed, tobacco stems, and corn germs. This dryer consists of a rotary steel shell with a steam head at one end and into which are inserted steam pipes set in rows running the full length. The dryer is set on a slight inclination so that the water of condensation drains into the steam head and is blown out automatically.

Operation—The material is fed into the dryer by a feed spout. Back of the rows of steam pipes are lifter flights which produce the showering effect in lifting the material as the dryer rotates. A stack or fan is used to create sufficient draft through the revolving shell to carry off the moisture.

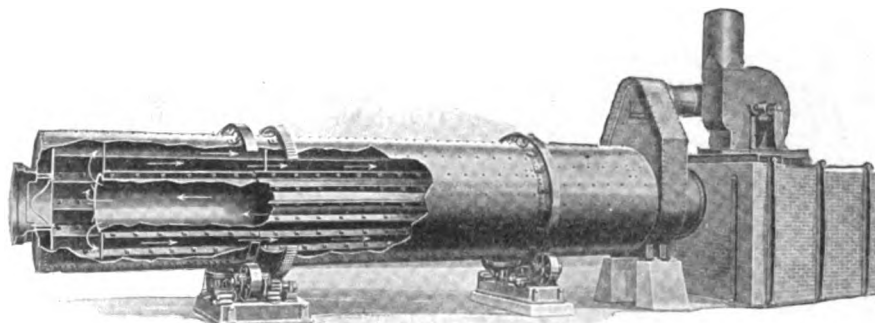
Class "D" and "E" Dryers—Paddle Type

These are distinct paddle dryers built in special sizes for direct heat, indirect heat, or steam, depending upon the material to be dried.

Class "F" Dryer—Single Shell Direct Heat

Lifting vanes on the inside of the rotating shell of this dryer create the necessary showering effect. The

material is dried through the passage of the hot gases through the showering material. This type of dryer is built in 5 standard sizes.



SECTIONAL VIEW OF RUGGLES-COLES CLASS "A" DRYER
Showing flow of gases

Catalogue

Write for
Catalogue No. 16.

SOWERS MANUFACTURING COMPANY

Dopp Seamless Apparatus

1307 Niagara Street
BUFFALO, N. Y.

BRANCH OFFICES

NEW YORK, N. Y.

BOSTON, MASS.

PHILADELPHIA, PA.

SAN FRANCISCO, CAL.

Products

"DOPP" CAST IRON SEAMLESS STEAM and OIL JACKETED KETTLES; TANKS; MIXERS (AGITATORS); VACUUM and PRESSURE KETTLES and PANS; SOAP CRUTCHERS.

SINGLE SHELL KETTLES with or without agitators.

Also Autoclaves, Digesters, Evaporators, Retorts and Chemical Stills.

Partial List of Industries Using Dopp Equipment

Batteries	Graphite	Paper, coated
Belt dressing	Grinding wheels	Pencils and crayons
Canning	Gum, chewing	Phosphorus and sulphur
Carbon paper	Ink	Polishing compounds
Celluloid products	Insecticides	Polish: Shoe, stove, etc.
Cements	Insulated products	Rubber cement
Chemicals	Laboratories	Sand paper
Chocolate	Leather, artificial	Salt
Cleaning compounds	Licorice	Silk, artificial
Cocoa	Linoleum	Soaps
Cold creams	Matches	Textiles
Drugs	Meat extracts	Tobacco
Dyestuffs	Oils and lubricants	Tooth paste
Explosives	Ointments and salves	Varnish
Food products	Oleomargarine	Wall board
Glass	Optical goods	Wax
Glues and Pastes	Packing houses	

Dopp Seamless Jacketed Kettles

Advantages and Special Features—Cast in One Piece—Kettle, jacket, staybolts (and outlet, when desired) are all in one piece, *not put together*, but cast complete all at one time, from one ladle of iron.

Thin Shells—Mean quicker heating and cooling.

Unusual Strength—Due to the seamless, staybolted construction. This not only reinforces the shell but facilitates circulation of heating or cooling medium.

Smooth Castings—Cast by a special process in which the iron does not come in contact with the moulding sand. This produces an absolutely smooth surface without necessitating grinding, which destroys the wearing qualities of a kettle.

STANDARD DOPP KETTLE
WITH PIPE LEGS
Sizes, 1 to 125 gals.

iron does not come in contact with the moulding sand. This produces an absolutely smooth surface without necessitating grinding, which destroys the wearing qualities of a kettle.

Special High Grade Iron—Developed after years of experimenting—extremely close grained and tough,



STANDARD DOPP KETTLE WITH LUGS
Sizes, 150 to 1000 gals.

ADOPT THE DOPP

SLOGAN

having a tensile strength of from 35,000 to 40,000 lbs. Many products which would attack ordinary cast iron are being handled satisfactorily in Dopp equipment.

Long Lasting—Because of pure material used and simplest possible construction. No bolts or rivets to work loose. Many in operation for 35 years and longer.

Absolutely Safe—On account of their design, method of manufacture and the high tensile strength iron used. Every standard kettle tested to 150 lbs. hydrostatic pressure. Special kettles built for higher pressures.

Guaranteed—Guaranteed for life against defects in workmanship or material.

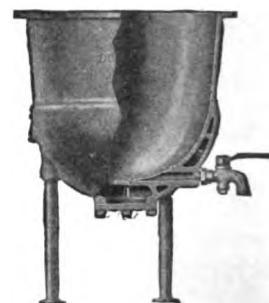
General Data—Outlets and Valves—We have many different styles of outlets and valves with which our kettles can be equipped for handling materials from thin fluids to thick viscous substances. Details on request.

Legs—Kettles up to 125 gals., inclusive, are fitted with 3 pipe legs; sizes 150 to 1000 gals., with 4 cast iron lugs for support. Special cast iron legs giving any desired clearance can be furnished for these larger kettles.

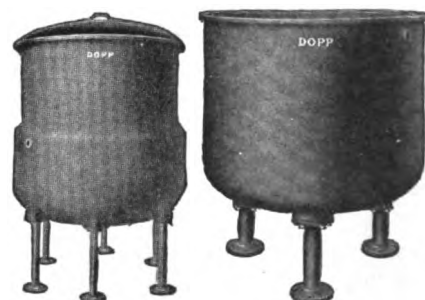
Covers—Either of sheet metal or of cast iron for pressure or vacuum.

Oil Jacketed Kettles—The seamless feature (obviating oil leaks), the thin yet safe walls and the staybolt construction make the Dopp kettle most efficient for use in connection with oil heating systems. Temperatures up to 575° Fahr. can be reached and maintained inside the kettle. Details on request.

Single Shell Kettles—While we specialize in jacketed apparatus, any of our kettles can be furnished without the jacket. These single shell kettles can be equipped with any of our various styles of agitators.



DOPP KETTLE WITH CAST-THROUGH OUTLET
Used in hotels, restaurants, etc., for cooking food products



Half Jacket Full Jacket
FLAT BOTTOM TYPES OF DOPP JACKETED KETTLES

Mixers (Agitators)

Below are illustrated a few of our many different styles of mixing kettles. These can be furnished in sizes from 5 to 1000 gals. capacity.

We have an agitator for practically every mixing requirement. If the type required is not illustrated herein, write us, giving details of the product and we will advise you promptly.



Style A
Bracket Type

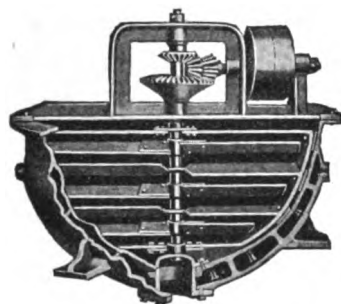
Agitator can be raised up out of the kettle and swung to side. Bracket types not made larger than 100 gals.



Style B
Bracket Type

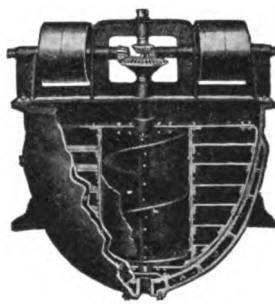


Style B
With Steel Belt
Has advantage of
seamless construction
in jacketed section

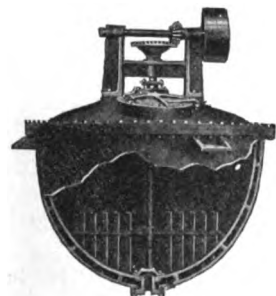


Style D. Double Motion

Two sets of paddles revolve in opposite directions. Adjustable steel scrapers attached to outside sweep

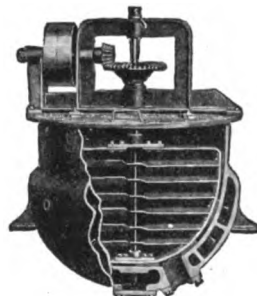


Style A-D. Double Motion
Conveyor screw in center
surrounded by drum and paddles
revolve in opposite directions



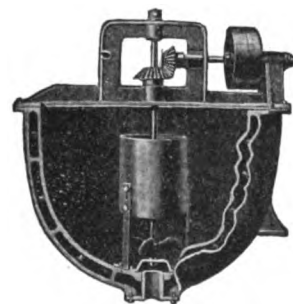
Style I. With Cover

Any mixer can be furnished with covers of this type for either pressure or vacuum



Style J

Adjustable steel scrapers scrape entire inner surface of kettle



Style K

Propeller forces contents up through drum where swirl is broken by means of stationary vanes



Style L

Action of ribbon is to raise contents from side and dump towards center of kettle

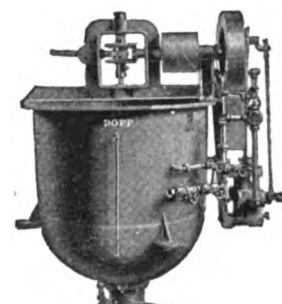
A FEW STYLES OF DOPP MIXERS OR AGITATORS

Dopp Soap Crutchers

Illustrations show our improved types of crutchers which are used extensively in the soap making industry. Kettles are of *seamless* construction as described on preceding page. This eliminates all possibility of leaks and, as the inside of the kettle is perfectly smooth, it can be quickly and easily cleaned after each operation. Agitator is of the conveyor screw type surrounded by pipe radiator or jacketed drum. Style A is provided with tight and loose pulleys as illustrated. Style B is provided with an 8-h.p. engine, making it ideal for either small plants where engine can be used to drive other machinery or large plants where it is easier to run piping than shafting.



Style A. Belt Driven



Style B. Engine Driven

DOPP SOAP CRUTCHERS
Capacity, 1000 to 5000 lbs.

Dopp Vacuum Pans

The basis of these pans is the "Dopp" seamless jacketed kettle used for the lower half. The dome being practically the same shape as the kettle makes a very symmetrical and well proportioned apparatus. They are particularly suitable for use where easy cleaning and absolute dryness are essential.

Furnished either with or without agitator in sizes from 10 to 2000 gals. total capacity. All standard pans fitted with manhole, peepholes, vapor outlet and openings for thermometer, vacuum gauge and vacuum breaker.



Sizes over 100 gals.
furnished with lugs



Sizes up to and
including 100 gals.
furnished with pipe
legs

When save-all, condenser and pump are desired, we will gladly furnish estimates on receipt of complete data covering customer's requirements.



With Single
Motion Agitator



With "J"
Agitator



With Double
Motion Agitator

A FEW STYLES OF DOPP VACUUM PANS

GRAND RAPIDS VENEER WORKS

Grand Rapids Vapor Kilns

800-1000 Front Avenue, N. W.
GRAND RAPIDS, MICH.

WESTERN BUILDERS OF GRAND RAPIDS VAPOR KILNS
SEATTLE, WASH., WESTERN VAPOR KILN CO.

BRANCH OFFICES

SEATTLE, WASH., WESTERN VAPOR KILN Co., 1608 Hoge Building
MANCHESTER, ENGLAND, OLIVER MACHINERY Co.
HAMBURG, GERMANY, HAMPE & HARTWIG

ST. JOHNS, N. B., A. R. WILLIAMS MACHINERY Co.
SYDNEY, AUSTRALIA, BOORMAN & BOORMAN

Products

Designers and manufacturers of GRAND RAPIDS VAPOR KILNS; KILN TESTING INSTRUMENTS: Grand Rapids Lumber Testers, Linnodeiks (wet and dry bulb thermometers), Recording Thermometers; PANELS and VENEERS.

Also, "Tiemann" Humidity Regulated Kilns, Forest Products Laboratory Kilns, Ebonoid Waterproofing Paint, "Kilntite" Kiln Lining, "Plastico" (plastic cement), "Hussey" Door Carrier, Koil-Kote, Metal-Kote and Kurtain-Kote, Kiln Paints.

Services

Complete engineering and contract service, consultation, designing, installation, equipment, operation and remodeling.

In Pacific coast territory, the affiliated company, the Western Vapor Kiln Co., takes complete contracts for kiln buildings, equipment, yards, etc. In other territory co-operation with local contractors is given.

Grand Rapids Vapor Process

A cooking process which dissolves and evaporates sap coagulations (which are not elements of strength but of decay), leaving intact the fibrous structure of the wood with its essential oils and gums, thus maintaining its strength, expanding instead of contracting the lumber and making it practically independent of changes of temperature or climate.

Lumber Dry Kilns

Made in box, single charge and progressive types. Preliminary conference on kiln layouts solicited. Partial service through engineers and architects will be rendered, or complete service, making all building plans and specifications, supplying and installing all equipment, demonstrating and training operator, all under definite guarantee as to cost and output.

Kilns designed, remodeled and equipped to meet the exacting government requirements of *airplanes, gunstocks, shipbuilding, vehicles*, etc.

Testing Instruments, Kiln Records

Grand Rapids lumber tester for determining moisture content of lumber. Linnodeiks for determining relative humidity in kiln atmosphere by means of maximum reading wet and dry bulb thermometers. Recording thermometers, psychrometers, decimal rules, metric scales, etc.

Consultation solicited on kiln operations by means of submitting the operation records. A full line of kiln record blanks, recording thermometer dials and graphic charts constantly in stock. Samples on request.

Veneers and Panels

Manufacturers (on approved list of United States Government) of waterproof plywood for army and navy

airplane construction; also of a full line of foreign and domestic veneers, together with a complete line of thin lumber, panels and heavy built-up stock for furniture, desk, phonograph and piano manufacturers.

Leaflets

Uniform loose leaf style, 4x10 in. with cover, cheerfully sent on request without charge.

13. "Why" (drying questions answered)	60. Kiln Drying Common Dimension
29. Scientific Lumber Drying	70. Kiln Drying Pine (Western)
30. Cooking Lumber Dry	71. Kiln Drying Fir, Spruce, Hemlock, Cedar
31. Correct Methods of Drying	80A. Kiln Instruments
32. Economical Arrangement of Kilns	80C. Grand Rapids Vapor Kiln Instruments
36. Efficient Dry Kiln Layouts	83. Maps, Showing Vapor Kilns
37. Costs of Kiln Drying Lumber	84. Trucks, Transfers, Lifts, etc.
38. Lumber Drying Tests	86. Natco Hollow Tile for Kilns
40. Kiln Drying Lumber at Saw Mills	88. Record Booklets and Blanks
42. The Engineer and the Wood-working Industry	89. Export Kilns
50. Lecture Courses on Kiln Drying of Lumber	

References

FURNITURE	RAILROAD CARS
Berkey & Gay Furniture Co., Grand Rapids, Mich.	American Car & Fdry. Co., St. Louis, Mo.
Imperial Furniture Co., Grand Rapids, Mich.	Pullman Co., Michigan City, Ind.
Kroehler Mfg. Co., 4 plants	Pressed Steel Car Co., 2 plants
Crocker Chair Co., Sheboygan, Wis.	Canadian Car & Fdry. Co., 2 plants
Breece Manufacturing Co., Portsmouth, Ohio	Eastern Car & Fdry. Co., New Glasgow, N. S.
AIRPLANES	MUSICAL INSTRUMENTS
Thomas-Morse Corp., Ithaca, N. Y.	Sohmer & Co., Astoria, N. Y.
U. S. A., McCooks Field, Dayton, Ohio	Baldwin & Co., 2 plants
SAWMILLS	Lyon & Healy, Chicago, Ill.
Shevlin-Hixon Lumber Co., Bend, Ore.	Heintzman & Co., Toronto
Booth-Kelly Lumber Co., 3 plants	Simplex Player Action Co., Worcester, Mass.
Bloedell-Donovan Mills, Bellingham, Wash.	Gulbrandsen & Dickinson, Chicago, Ill.
Miller-Link Lumber Co., Orange, Tex.	AUTOMOBILE BODIES
Meadow River Lumber Co., Rainelle, W. Va.	Packard Pierce- Fisher
MARINE	Franklin Arrow Cadillac
Cramp Ship & Eng. Bldg. Co., Philadelphia, Pa.	Peerless Nash General
Detroit Shipbuilding Co., Detroit, Mich.	Dodge Reo Motors
Toledo Shipbuilding Co., Toledo, Ohio	INTERIOR TRIM
American Balsa Corp., New York, N. Y.	Morgan Co., Oshkosh, Wis.
VEHICLES	Farley & Loetscher Mfg. Co., 2 plants
Republic Truck Co., Alma, Mich.	Curtis & Bros., 4 plants
Thornhill Wagon Co., Lynchburg, Va.	J. B. Smith & Sons, Ltd., Toronto, Can.
Massey-Harris Co., Toronto	GENERAL
Sayers & Scovill, Cincinnati, Ohio	Eastman Kodak Co., Rochester, N. Y.
	Remington Arms & Ammunition Co., Ilion, N. Y.
	Seth Thomas Clock Co., Thomaston, Conn.
	Cincinnati Butchers' Supply Co., Cincinnati, Ohio
	Kellogg Switchboard & Supply Co., Cassopolis, Mich.
	Conlon Electric Washer Co., Chicago, Ill.

3000 installations in service

STEACY-SCHMIDT MANUFACTURING COMPANY

Manufacturers of Lime Kilns and Complete Hydrating Plants

YORK, PA.

CABLE ADDRESS: "BROOMELL"—Codes used: ABC 5th Edition and Western Union

Products

KEYSTONE LIME KILNS, complete Lime and Hydrating Plants, and Equipment for Eldred Process for Lime Burning.

Also manufacturers and designers of Sugar Machinery, Filters, Stacks, Tanks, Gray Iron Castings, Pulverizing Mills and Machine Work from Engineers' Designs.

Engineering Service

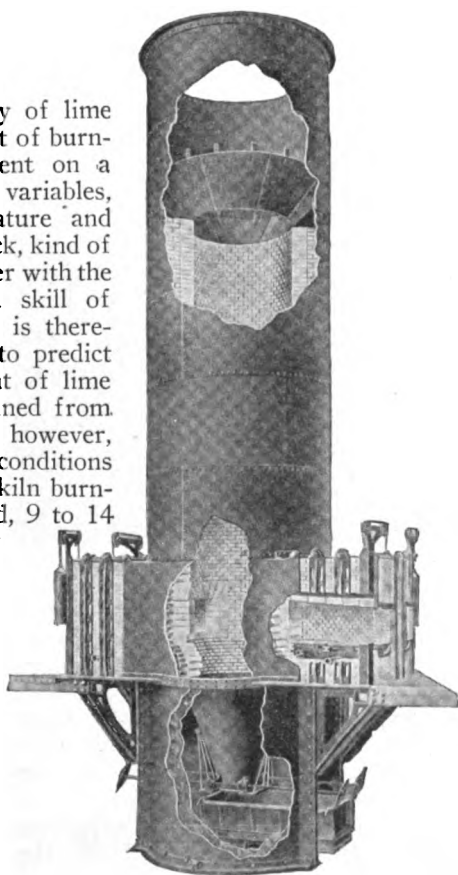
While the Keystone kiln is the main unit in a hydrating plant, our engineers are in a position to design and supervise the construction of the entire hydrating plant.

Keystone Lime Kilns

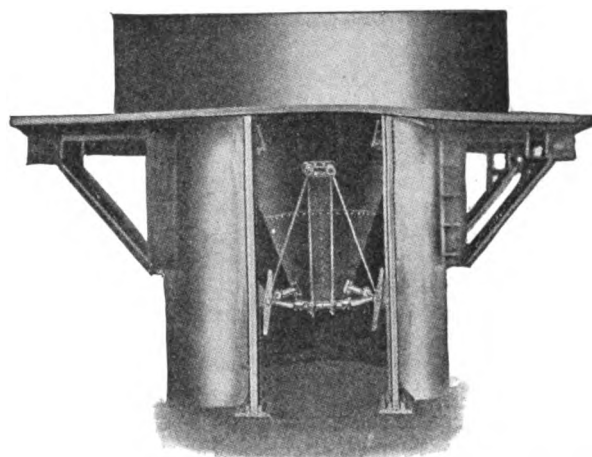
The Keystone kiln is the result of kiln practice extending over many years of experience. This kiln is of all-steel, brick lining construction, built of heavy steel boiler plate to give the strongest possible construction. It is arranged to burn coal, wood, gas, or oil as fuels. The special features of this kiln allow continuous operation, the rock being supplied at the top through a feed cone and drawn off through the cooling cone by drawing shears.

Capacity

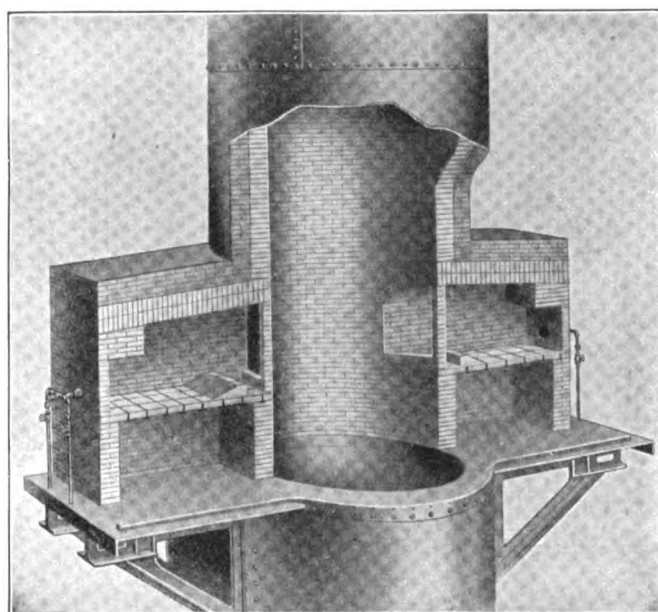
The capacity of lime kilns and the cost of burning are dependent on a large number of variables, such as the nature and quality of the rock, kind of fuel used, together with the management and skill of the burners. It is therefore impossible to predict the exact amount of lime that can be obtained from a given kiln; however, under average conditions with a standard kiln burning coal or wood, 9 to 14 tons per day may be produced. If forced or induced draft is used, these figures are exceeded. With producer gas or oil as fuel, the capacity ranges from 14 to 25 tons per day.



SECTIONAL VIEW KEYSTONE LIME KILN



VIEW SHOWING KEYSTONE KILN SET AT RIGHT ANGLES TO DRAWING SHEARS



SECTIONAL VIEW SHOWING OIL BURNING TYPE

Specifications

The standard kiln has an outside diameter of 11 ft.; diameter of brick lining, 6 ft. 6 in.; total height of kiln, 47 ft. 10 in. Shipping weight, about 42,500 lbs.

General

Our pattern, foundry, machine and boiler shops have been recently remodeled and equipped with the latest tools and machines, and are able to produce economically gray iron castings, stacks, tanks, boilers, sugar machinery, dryers, pulverizing machinery, elevators, bins, conveyors, and special machine work from engineers' designs constructed in exact accordance with specifications.

C. G. BUCHANAN CO., INC.

Crushing Machinery

90 West Street

NEW YORK, N. Y.

Products and Service

CRUSHERS and CRUSHING ROLLS.

BUCKET ELEVATORS.

BELT CONVEYORS.

REVOLVING SCREENS.

MAGNETIC SEPARATORS and HEAD PULLEYS.

Designers and builders of Complete Stone Crushing and Concentrating Plants.

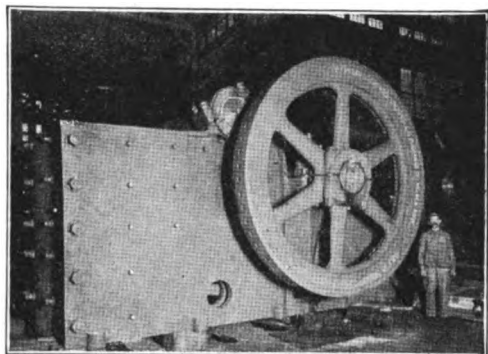
Magnetic Ore Separation Plants a Specialty.

Buchanan All-steel Crushers

Type "C"—This type Buchanan crusher is made in over 20 sizes to meet varying conditions. All bearings are water-jacketed and in the larger sizes are removable. Jaw, cheek plates and toggle bearings are manganese steel. Pitman is spring balanced and made parting with underfeed and overfeed lubrication provided for the bearings. All crushers fitted with our adjustable jaw stroke. Several sizes of Buchanan crushers are made sectional for convenience in handling for underground operations. All steel castings thoroughly annealed.

Adapted for preliminary crushing of rocks and ores to sizes suitable for feeding to secondary crushers.

Fully described in Bulletin 10.

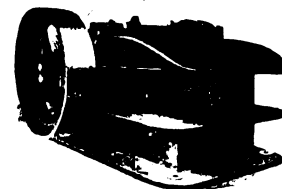


BUCHANAN TYPE "C" CRUSHER

STANDARD SIZES, WEIGHTS, CAPACITIES, SPEEDS, ETC., IMPROVED TYPE "C" CRUSHER

Type	Jaw opening, in.	Approximate weight, lbs.	Speed, r. p. m.	Tons per hour to sizes below (Approximately)			Size of pulley, in.	Approximate h. p. required
				tons in.	tons in.	tons in.		
Box—Coarse.....	60x84	550,000	85	285 to 8	360 to 10	450 to 12	168x36	250-300
Box—Coarse.....	48x72	264,000	125	315 to 7	360 to 8	450 to 10	120x30	150-180
Box—Coarse.....	48x60	244,000	125	260 to 7	300 to 8	375 to 10	120x24	140-165
Box—Fine.....	42x72	262,000	125	225 to 5	270 to 6	315 to 7	120x36	150-180
Box—Fine.....	42x60	244,000	125	185 to 5	225 to 6	260 to 7	120x36	140-165
Box—Medium.....	42x54	195,000	150	250 to 7	290 to 8	360 to 10	90x36	125-150
Box—Fine.....	38x54	193,000	150	215 to 6	250 to 7	290 to 8	90x36	125-160
Panel—Coarse.....	36x48	172,000	175	130 to 4	165 to 5	200 to 6	84x24	100-125
Panel—Fine.....	42x48	173,500	150	225 to 7	260 to 8	320 to 10	90x30	110-140
Panel—Fine.....	38x48	171,500	150	160 to 5	190 to 6	225 to 7	90x30	110-140
Panel—Coarse.....	36x54	130,000	175	225 to 6	300 to 8	375 to 10	84x24	125-150
Panel—Fine.....	36x54	128,500	175	185 to 5	225 to 6	260 to 7	84x24	125-150
"Special" (Box)—Fine.....	36x48	172,000	175	130 to 4	165 to 5	200 to 6	84x24	125-150
Panel—Coarse.....	36x48	118,000	175	190 to 6	260 to 8	325 to 10	84x18	100-125
Panel—Fine.....	32x48	117,000	175	160 to 5	190 to 6	225 to 7	84x24	100-125
Panel—Fine.....	36x42	116,000	175	175 to 6	235 to 8	290 to 10	84x18	90-115
Panel—Fine.....	36x42	115,500	175	145 to 5	175 to 7	200 to 7	84x18	90-115
Panel—Fine.....	30x42	115,500	175	145 to 4½	190 to 6	225 to 7	84x24	100-125
Panel—Fine.....	30x42	110,000	175	115 to 4	145 to 5	175 to 6	84x20	90-115
Panel—Coarse "Special".....	30x42	70,000	200	175 to 6	200 to 7	235 to 8	70x24	90-115
Panel—Fine "Special".....	24x42	69,000	200	85 to 3	115 to 4	145 to 5	70x24	90-115
Panel—Fine "Special".....	24x48	110,000	200	100 to 3	135 to 4	200 to 6	70x24	110-135
Panel—Coarse.....	30x36	68,500	200	90 to 5	105 to 6	125 to 7	70x18	60-75
Panel—Fine.....	24x36	67,000	210	45 to 3	60 to 4	75 to 5	70x18	60-75
"Sectional".....	24x36	68,000	210	45 to 3	60 to 4	75 to 5	70x18	60-75

Type "B"—Constructed with main frame cast of steel in one solid piece. Made in 20 sizes from a 2x4 in. laboratory crusher to 24x36 in. for preliminary crushing. Jaw and cheek plates of manganese steel. Pitman water-jacketed, and in larger sizes (over 12x20 in.) made parting. Equipped with our patent adjustable jaw stroke for increasing or decreasing stroke for fine or coarse crushing. Phosphor bronze removable bearings on all sizes up to and including 12x20 in. All steel castings thoroughly annealed.

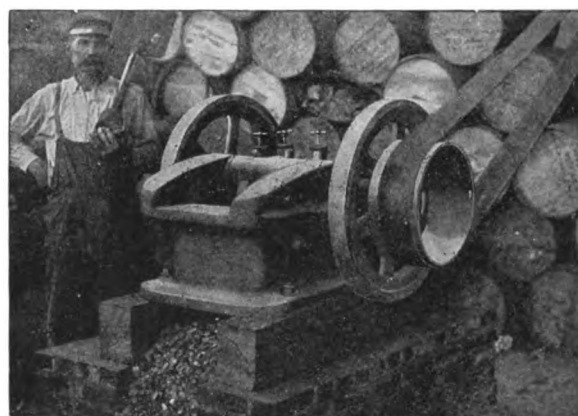


Detailed description in Bulletin 9.

FRONT VIEW BUCHANAN 18x36 IN. TYPE "B" CRUSHER

STANDARD SIZES, WEIGHTS, CAPACITIES, SPEEDS, ETC., TYPE "B" CRUSHER

Size receiving capacity, in.	Approximate capacity in tons, per day of 10 hours to any one of sizes stated				Size of pulley, in.	Speed, r.p.m.	H. p.	Approximate total weight, lbs.
	tons in.	tons in.	tons in.	tons in.				
2 x 4							Belt or hand	163
4 x 12	30 to 2½	20 to 1½	15 to 1	8 to ½	18x8	300	4-5	2,775
8 x 14	100 to 2½	85 to 2	60 to 1½	35 to 1	24x10 (1)	275-300	8-12	6,500
10 x 16	170 to 3	150 to 2½	125 to 2	100 to ¾	30x12 (1)	275-300	12-18	9,300
12 x 20	230 to 3	200 to 2½	175 to 2	130 to 1½	36x12 (1)	250-275	18-25	15,000
13 x 24	300 to 3	260 to 2½	215 to 2	160 to 1½	42x8 (2)	250-275	20-30	24,600
15 x 24	400 to 4	350 to 3½	300 to 3		42x8 (2)	250-275	20-30	23,500
13 x 30	375 to 3	320 to 2½	275 to 2	200 to 1½	42x10 (2)	250-275	30-40	33,000
15 x 30	500 to 5	450 to 4	375 to 3		42x10 (2)	250-275	30-40	33,450
16 x 36	650 to 4	575 to 3½	500 to 3	400 to 2	42x10 (2)	250-275	50-60	47,750
18 x 36	900 to 6	800 to 5	650 to 4	575 to 3½	42x14 (2)	250-275	50-60	57,000
24 x 36	1000 to 6	850 to 5	750 to 4½	700 to 4	48x14 (2)	250-275	50-60	57,000



A BUCHANAN CRUSHER REDUCING FERRO-MANGANESE

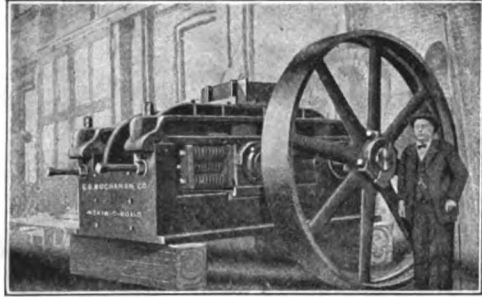
The crusher can be adjusted to produce a very uniform product of any desired degree of fineness, from 1½ to ½ in. size, effecting a saving of from 20% to 25% of manganese. When manganese is crushed to a uniform size a much better and more intimate mixture can be made, thereby producing a much better quality of metal and at the same time effecting a very marked saving in the use of manganese.

A very important economy is the saving through the use of a crusher as compared with the old hand method of breaking up with hammers, with much waste.

Crushing Rolls

These rolls are made in sizes from 18x12 in. to 42x16 in. and special from 36x18 in. to 72x36 in. Phosphor bronze bearings. Stationary roll provided with fleeting adjustment to provide moving roll side-ways to prevent grooving. The adjustable or moving roll is provided with our patent swivel pillow blocks to keep bearings in alignment and prevent cramping of the shafts when passing iron or other hard substances through the rolls.

Bulletin 13 gives further details and describes our other crushing rolls.

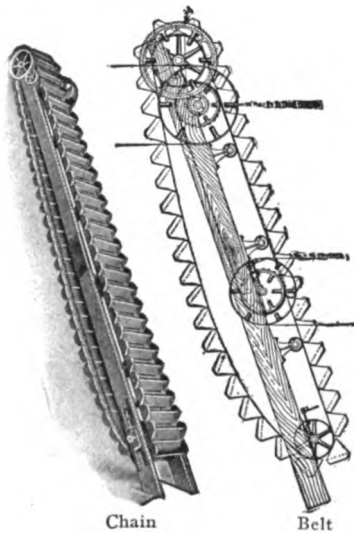


BUCHANAN TYPE "C" CRUSHING ROLLS

Bucket Elevators

In crushing plants, elevators as a rule give more trouble and cause more loss of time than any other piece of equipment. The reason is that frequently the elevator or conveyor installed is not adapted for the work it is intended to perform. When properly designed and built, the elevator will cause no more trouble than any other equipment exposed to the abrasive action of the material handled.

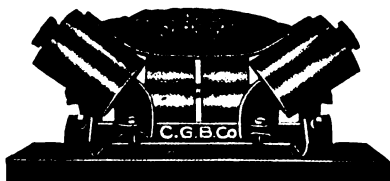
We build and have patterns for a full line of elevators, either chain or belt, using buckets from 4 to 6 in. up to and including 24x60 in., having capacities from 10 to 500 tons per hour.



BUCKET ELEVATORS

Belt Conveyors

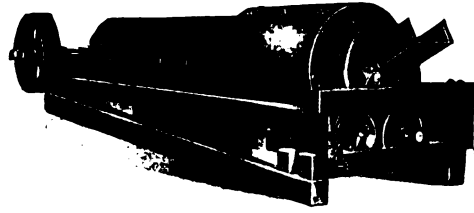
In connection with our crushing machinery, magnetic separators and magnetic head pulleys, we furnish belt conveyors of the most approved design, in all sizes, adapted for either fine or coarse material.



BELT CONVEYOR

Revolving Screens

These screens are well designed and built of the best material for the purpose. They are largely used for screening coarse or medium fine material. Screen sections are removable for replacement without the necessity of taking entire screen apart. When desired, dust jacket can be furnished for removal of dust.



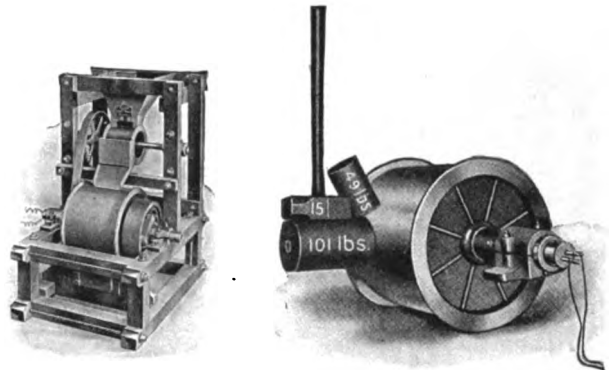
BUCHANAN GIRDER TYPE REVOLVING SCREEN

Made in a number of sizes, from 36 in. x 12 ft. up to and including 72 in. x 30 ft.

Magnetic Separators and Head Pulleys

These separators are designed for use in the treatment of iron or other magnetic ores, also for separating iron from brass turning or similar purposes. Another use is separating "tramp iron" from materials being pulverized.

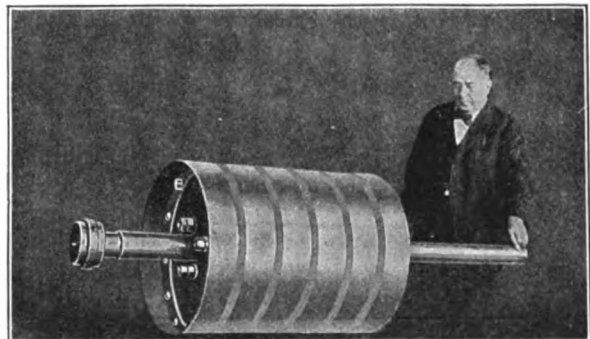
Drum Separator—The Buchanan standard. Has magnets with hole pieces of alternating polarity. Built in sizes from 14x6 in. to 36x24 in., with or without automatic feed.



BUCHANAN MAGNETIC DRUM SEPARATOR

ILLUSTRATING THE MAGNETIC INFLUENCE OF BUCHANAN DRUM

Head Pulleys—Buchanan magnetic head pulleys are made in sizes from 12x12 in. to 42x36 in. or wider if desired. Very strong and simple in construction. Used on conveyor belts in place of the regular head pulley.



BUCHANAN MAGNETIC HEAD PULLEY

STURTEVANT MILL COMPANY

Crushing, Grinding, Screening, Mixing and Elevating Machinery

CABLE ADDRESS
"EMERYSTONE, BOSTON"

Harrison Square
BOSTON, MASS.

CODES USED
Lieber's, Western Union
and Private

Products

CRUSHING, PULVERIZING, GRANULATING, GRINDING, SAMPLING, SCREENING, SIZING, AIR SEPARATING, MIXING (Dry and Wet), ELEVATING and CONVEYING MACHINERY.

Also manufacturers of Sheet Metal and Structural Work, Hoppers, Valves, Scales, Bins, Chutes, etc.

ENGINEERING and CONSULTING SERVICE.

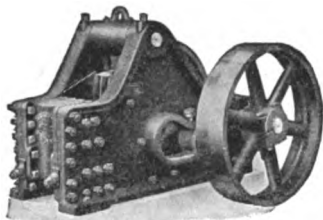
Sturtevant Experience and Service

Thirty-eight years of success in inventing, experimenting, designing, building, erecting and operating crushing, grinding, pulverizing, screening, sampling, elevating, conveying, and mixing machinery, and plants; the experience gained in observing the methods employed in hundreds of plants; the numerous problems which have been intrusted to it to solve; the erection of modern units; the improvements accomplished in older installations; and constant consultation with other engineers, superintendents, contractors, architects and practical operators, place the STURTEVANT MILL COMPANY in a position to know what others are accomplishing, the best methods, processes and machinery.

Realizing that no one machine or type is the best for all work, and knowing the limitations of each device, it is the policy of the STURTEVANT MILL COMPANY to recommend the machine best suited for the purpose regardless of its maker, or competition with its own equipment. It will not attempt to supply a machine which can not fulfill the requirements satisfactorily.

The design and manufacture of Sturtevant products are the work of specialists, thus large and competent engineering, constructing and erecting forces are maintained, the knowledge and experience of which are at the disposal of prospective customers.

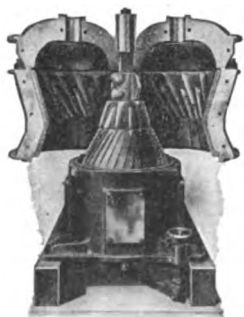
Crushers, Grinders and Pulverizers



JAW TYPE CRUSHER

Jaw Crushers—For coarse, intermediate and fine crushing. Plate steel, cast steel or cast iron construction. Blake, Dodge and roll jaw actions. Cam and roll designs.

Catalogue No. 62.



ROTARY TYPE CRUSHER

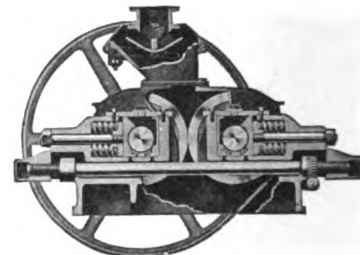
Rotary Crushers (not Gyratory)—For the fine reduction of soft and moderately hard materials, such as lime, gypsum, talc, soapstone, clay, coal, caustic soda, salt, etc. Open door, accessible construction and hand wheel adjustment.

Instantly adjustable while in operation. Inexpensive to buy, belt, erect and run. One of the most popular machines built by this company.

Catalogue No. 63.

Roll Crushers—For crushing, pulverizing and granulating—coarse or fine work. Balanced construction. Springs back of all four bearings give instant relief under breaking pressures; crushing shocks are quartered; automatic adjustments. Catalogue No. 65.

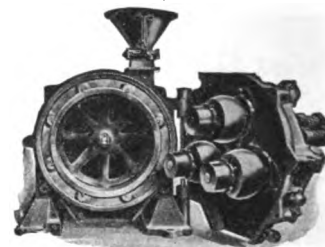
Also Single Roll Crushers.



ROLL TYPE CRUSHER

Ring-Roll Mills—For grinding hard, medium or soft material from 1½-in. size to from 10-mesh to 100-mesh. Used largely for grinding cement clinker, limestone, ores, granite, trap, phosphate, clay, shale, iron borings, feldspar, etc. Slow speed; durable and accessible. Wearing parts are a ring and 3 rolls, easily and quickly replaced. No clogging, no internal screens, no shields nor scrapers. Large capacity per horsepower and low upkeep.

Catalogue No. 79.



RING-ROLL MILL

Swing Sledge Mill—For reducing limestone, lime, coal, shale, clay, etc., to a fineness of from ½ in. to 20-mesh. "Open door" accessibility is shown in illustration and is of great importance in pulverizers of this class where adjustments and repairs are frequent. It is a great labor saver. Self-aligning ball bearings are another feature allowing the machine to run at very high speeds. Many kinds of hammers and sledges are used for various purposes.

Catalogue No. 84.



"OPEN DOOR" SWING SLEDGE MILL

Hinged Hammer Pulverizers—For reducing salt, clay, shells, fertilizers, chemicals and other soft or fibrous materials to a fineness of from ¼ in. to 20-mesh. A high speed, inexpensive mill, having large output with small horsepower.

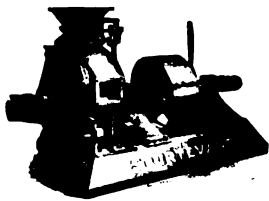
Catalogue No. 84.

Laboratory Crushers and Grinders—Roll Jaw Fine Crushers—Used extensively in laboratories, assay offices, mining schools, steel mills, etc., for sampling.

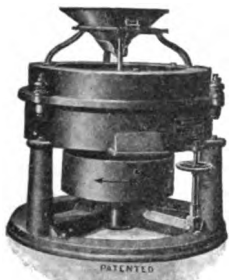
Crushing Rolls—For crushing hard or soft rock and ores, usually for reducing crusher outputs to finer sizes.

Sample Grinders—For fine grinding of rock and ore samples.

Catalogue No. 67.

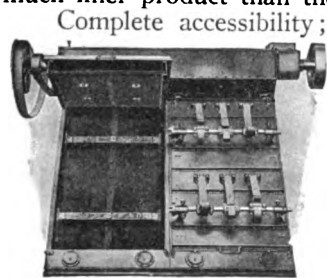


Vertical

Horizontal
ROCK-EMERY MILLSAUTOMATIC COAL
CRUSHER AND SAMPLER

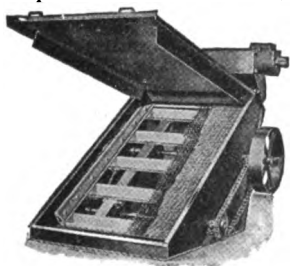
Screens

Newaygo Superscreens—These inclined vibrating separators are of unit "open door" construction, capable of delivering from one to four products from one separator with a range of fineness from $\frac{1}{2}$ in. to 180-mesh. All screening surfaces are on an angle of from 35° to 45° , therefore a comparatively coarse mesh delivers a much finer product than the dimension of its openings.



"OPEN DOOR" TWO-UNIT SCREEN

"Bucking Broncho" Screens—Simple, durable, inclined screens built on principles never before attempted and which have proved a remarkable success.



"BUCKING BRONCHO" SCREEN

Emery Mills—Vertical and horizontal types for grinding soft and moderately hard materials such as clay, shale, chalk, talc, salt, coal, facings, colors, lime, manganese, barytes, etc., to a fine powder. Economical in power and upkeep and instantly accessible. Feed, $\frac{1}{4}$ in. and finer; range of output, 20- to 200-mesh. On ordinary material, they grind to 100-mesh without screens or separators. Finer than this, bolts, reels, screens or air separators are desirable. Run without vibration on any good floor. Furnished right- or left-hand discharge with automatic feeders. Catalogue No. 64.

Automatic Coal Crushers and Samplers—For crushing and automatically sampling coal preparatory to analysis. Take coal 3 in. in size or finer, crush it to $\frac{1}{4}$ in. and finer and at the same time automatically extract a sample of 5%, 10% or 15% of the amount passing through the machines. This sample is an accurate representation of the whole. Used by many plants purchasing fuel on a B. t. u. basis.

Catalogue No. 85.

Catalogue No. 77.

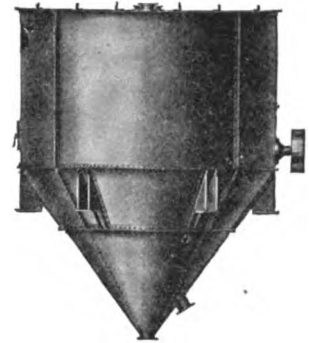
They combine the actions of all other screens with many additional slaps, kicks and jars of their own. Sticking or clogging of materials in the meshes is practically eliminated. Range of output, $\frac{1}{2}$ in. to 20-mesh. Capacity depends upon material and fineness of product desired.

Catalogue No. 77.

Air Separators

Simple, durable, slow speed air separators for removing the fines from the products of grinding mills within a range of from 60- to 100-mesh. Coarser than this, a screen is better suited, and for finer work, special air separators are made. They are simple, and easily installed and operated. Fineness of products is regulated by turning a hand wheel. There is nothing to get out of order or give trouble.

Catalogue No. 87.



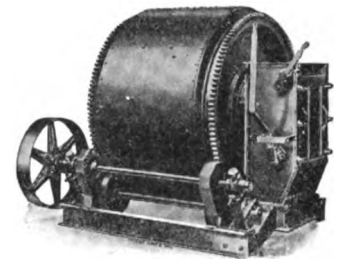
AIR SEPARATOR

Mixers

Dry mixers for mixing fertilizer and other dry ingredients in batches from $\frac{1}{4}$ to 2 tons. Capacities from 4 to 40 tons per hour.

A simple and durable machine that accomplishes a thorough and rapid mixing. Catalogue No. 80.

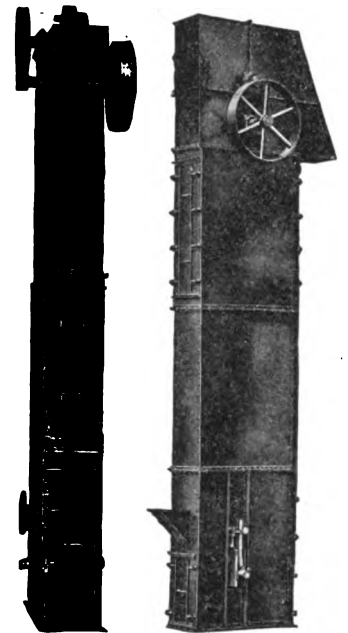
Wet mixers for making acid phosphate in fertilizer plants or for similar work.



"OPEN DOOR" DRY MIXER

Elevators and Conveyors

Elevators—Sturtevant elevators are of the "one-man, one-minute, open door" design for use with crushing, grinding and screening machinery or for many other purposes. All-steel, accessible construction so that one man in one minute can open any door without the use of tools and immediately get at all important parts. Self-contained, everything complete, ready to set up when received. Big, accessible discharge with fixed spillboard. Split head, heavy gears and pinions, ample shafts, ball and socket bearings. Automatic take-ups for quick, accurate foolproof adjustment, self-aligning bearings. Unequalled for convenience, labor saving, quick replacements and cleaning.



"OPEN DOOR" ELEVATORS

Furnished in belt or chain, centrifugal, continuous or perfect discharge types, with steel or wood casings.

Conveyors—Belt, screw, pan, platform, drag, bucket, portable or special designs.

Valves and Gates—Single or duplex; lever or rack and pinion types.

Catalogue No. 61.

Other Machinery

Standard grinding, mixing, and shipping units complete are supplied for general use. Mechanical den excavators and aerators for fertilizer plants.

HARDINGE COMPANY

Manufacturers of Crushing, Grinding and Pulverizing Equipment

120 Broadway
NEW YORK, N. Y.

BRANCH OFFICES

SALT LAKE CITY, UTAH, Newhouse Building

LONDON, ENGLAND, 11 Southampton Row, W. C. 1

Products and Service

Manufacturers of HARDINGE CONICAL BALL and PEBBLE MILLS.

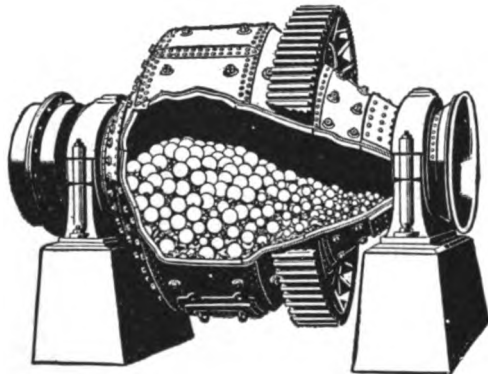
ENGINEERS for the Erection and Design of Industrial Plants.

For Fuel Systems, see page 541.

Sizes and Capacities

The Hardinge Conical Ball and Pebble Mill is made in sizes from 20 in. in diameter to 10 ft. in diameter, with capacities ranging from a few pounds per hour to 50 tons an hour.

Ball mills are used to take a rock crusher product and grind to pass 20-, 40-, 80- or 200-mesh. Pebble mills are used to take a 1/2-in. feed and grind to any fineness. The wear on lining and balls in the ball mill is surprisingly low. The pebbles in the pebble mill do not contaminate the material being ground.



HARDINGE CONICAL MILL

Note how the conical discharge cone classifies the balls

Materials Ground

Materials being successfully ground in the Hardinge mill are:

Phosphate rock	Limestone for cement	Iron ores
Feldspar	Cement clinker	Graphite ores
Talc	Coal	Chrome ores
Silica	Coke	Manganese ores
Fullers' earth	Brass ashes	Molybdenum ores
Glass	Sulphur	Tungsten ores
Clay	Slags	Zinc ores
Graphite	Mattes	Copper ores
Chemicals	Lead skimmings	Silver ores
Colors	Zinc skimmings	Gold ores
Mica	Aluminum dross	Platinum ores
Barytes	Copper skimmings	Brass turnings
Ferro alloys	Iron borings	Steel turnings

Action in the Hardinge Mill

In the Hardinge mill, due to the action of the cone, the coarse material on entering the machine gravitates to the point of largest diameter. Here it comes in contact with, and is broken by, the largest balls moving at the highest velocity and falling from the greatest height. As the particles are broken, they automatically work their way forward, being subjected to a gradually diminishing breaking and crushing effect as they decrease in size. The particles undergoing reduction reach the re-

quired degree of fineness and arrive at the discharge end of the mill at the same time.

Thus it is seen that this automatic classification, both of the material being reduced and of the grinding mediums, as well as their height of fall, proportions the energy expended or exerted in crushing to the work required. In this way, we obtain an ideal step or stage reduction in a single machine, which is conducive to a maximum crushing effect for a minimum expenditure of power.

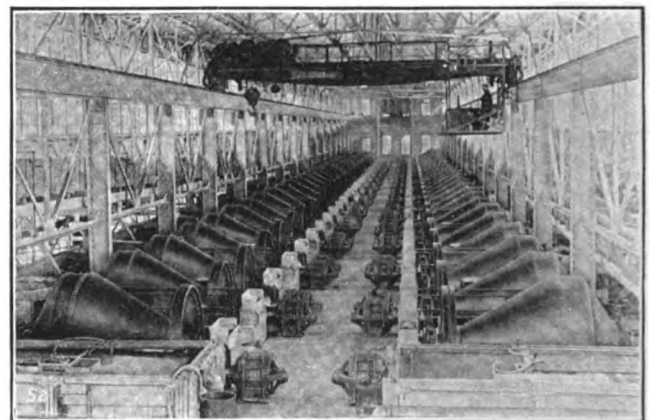
Wet Grinding in the Hardinge Conical Mill

The Hardinge mill is grinding nearly every class of material where it is necessary to reduce the size. Due to extreme flexibility and simplicity of operation of the mill, the power and repairs required to effect the necessary reduction are unusually low. By adjustment of the mill, the product may be varied so that it will be discharged in uniform granular particles, or an extremely fine powder can be produced if desired, containing no grit whatever.

Dry Grinding in the Hardinge Conical Mill

The same type of Hardinge mill is used when grinding dry as when grinding wet. Therefore, if it is desired to change from one class of grinding to another, the same mill can be used in either case. As in the case of wet grinding, either a very uniform granular product may be obtained or extremely fine dust produced, simply by making minor changes in the method of operation.

Abrasive materials have but little effect on the life of the very few wearing parts of the Hardinge conical mill. Many original linings are still in mills which have been operating for more than 10 years.



LARGEST SINGLE GRINDING INSTALLATION IN THE WORLD
64 Hardinge Mills operated by only two men per shift

Information Required

Character of material (send 2- or 3-oz. sample of feed).
Capacity required in tons per hour.
Size of feed to Hardinge mill.
Fineness of finished product desired.
Grinding to be done wet or dry (percentage of moisture in feed).
Machines now used to effect the same reduction.

DINGS MAGNETIC SEPARATOR CO.

Manufacturers of Magnetic Separators and Magnetic Pulleys

MAIN OFFICE
MILWAUKEE, WIS.

BRANCH OFFICES

NEW YORK, N. Y., 52 Vanderbilt Avenue
RICHMOND, VA., 1905 East Main Street

DENVER, COLO., 1718 California Street
DETROIT, MICH., 805 Hammond Building
CHICAGO, ILL., 616 South Michigan Avenue

Products

MAGNETIC PULLEYS; MAGNETIC SEPARATORS for iron, steel and brass foundries, and for reclaiming metals.

Also manufacturers of Suspended Type Magnets; Magnetic Chutes; Launder Magnets; High Intensity Separators for weakly magnetic minerals, both Dings and Rowand-Wetherill Types; Magnetic Drums for wet or dry concentration of iron ores; Complete Plants for Magnetic Concentration; Davis Magnetic Tube Concentrators for laboratory work upon magnetic ores.

Magnetic Pulleys

Magnetic Pulleys are used in crushing and pulverizing plants to remove iron and steel from conveyed material and to protect the crushing machinery from breakage. They are also used in concentrating magnetic ores.

The Dings Magnetic Pulley is designed in accordance with modern electrical practice and from the results of special investigations and tests.

The coils are impregnated by vacuum and pressure, with a high melting point insulating compound. Impregnation has several advantages other than increasing the di-electric strength of the insulation. Unimpregnated coils are poor conductors and frequently the temperature of hot points at the center of the coil is high enough to char the insulation. Impregnated coils have good radiating properties and a very slight rise in temperature in the interior. Consequently, Dings Pulleys are not subject to breakdowns and short circuits, such as are liable to occur in the unimpregnated types.

Another advantage is found in the fact that Dings coils are impregnated in place, cementing the coils to the cores. This construction prevents shifting of coils and cutting of connections; and also prevents moisture and so-called "sweating."

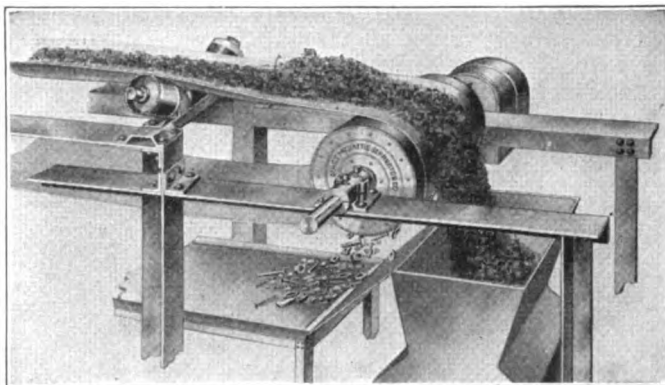
These are a few of the improved features found in Dings Magnetic Pulleys. Bulletin 25 gives full information in regard to standard sizes, capacities, etc.

Magnetic Separators

Magnetic Pulley Type Separators are used in shops and foundries to separate iron and steel from brass and other non-ferrous borings and turnings. They are

also used in reclaiming iron from sweepings, cupola slag, etc., in iron foundries.

In chemical industries special types are used for separating iron from a wide range of materials, thus improving many products. In mining and concentrating, they are used for refining ores and minerals.



DINGS PULLEY TYPE MAGNETIC SEPARATOR
Showing how tramp iron is removed from conveyed material

Magnetic separation is also used in connection with rubber reclaiming, fertilizers and glue, drugs, charcoal, pottery slip, coal dust, grain elevators, cattle and poultry foods, flour, distilleries, carbon and batteries, and many other uses.

Laboratory Tests

A complete testing laboratory is maintained in our Milwaukee factory. Samples will be separated for those interested. There is no charge or obligation for this service.

Facilities

We are prepared to furnish either standard or special types of separators for wet or dry work, with low, medium or high intensity magnetic fields.

Bulletins

Bulletins describing the uses of magnetic separation in many varied industries, will be sent on request.

E. W. BLISS CO.

Presses, Drop Hammers, Punches, Sheet Metal Working Machinery

MAIN OFFICES

BROOKLYN, N. Y.

SALES OFFICES

CHICAGO, ILL., Peoples Gas Building
CLEVELAND, OHIO, Cleveland Discount Building
BUFFALO, N. Y., Marine Bank Building
NEW HAVEN, CONN., Second National Bank Building

DETROIT, MICH., Dime Bank Building
CINCINNATI, OHIO, Union Trust Building
ST. LOUIS, MO., Boatmen's Bank Building
PITTSBURGH, PA., Oliver Building

AMERICAN FACTORIES

BROOKLYN, N. Y.

HASTINGS, MICH.

CLEVELAND, OHIO

SALEM, OHIO

FOREIGN SALES OFFICES AND FACTORIES

LONDON, ENGLAND, Pocock Street, Blackfriars Road, S. E.

PARIS, FRANCE, 100 Boulevard Victor-Hugo, St. Ouen

BIRMINGHAM, ENGLAND, Norwich Union Chambers

Products

PRESSES, DROP HAMMERS, PUNCHES, SHEET METAL WORKING MACHINERY, including:

Inclinable, Overhanging and Arch Power Presses; Horning, Wiring, Lock-Seaming, Punching, Straight-Side, Embossing, Reducing, Double Crank, Perforating, Cam, Toggle Drawing, Foot and Screw Presses; Single and Double Crank, Straight-Side and Overhanging Trimming Presses; Drop Hammers; Multiple Punches; Spinning Lathes; Trimming, Beading, Wiring, Flanging and Thread Rolling Machines; Double Seaming Machines; Shears and Slitters; Horse-shoe Machinery; Double Edging and Wire Ring Machines; Smoothing Rolls; Formers and Beaders; Auto-



matic Can Making and Petroleum Can Machinery, Fork and Hoe Machinery, Spoon and Fork Machinery, Expanded Metal Lath Machinery, Minting Machinery, Collapsible Tube Machinery, Barrel Machinery.

For Bliss Special Machinery see page 4.

Standard Machinery

The E. W. Bliss Co. manufacturers standard machinery in a wide variety of types and sizes, a few of which are here illustrated.

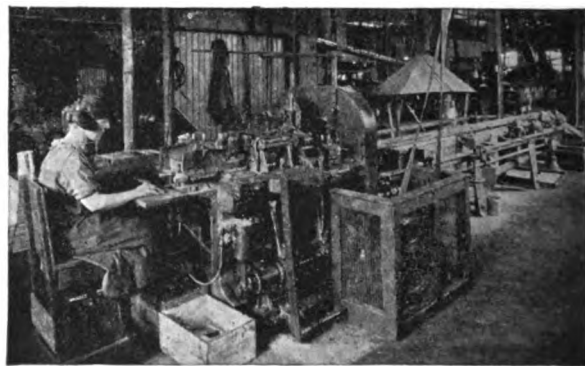
Catalogues

Catalogues giving detailed information on any type of Bliss machinery will be sent on request.



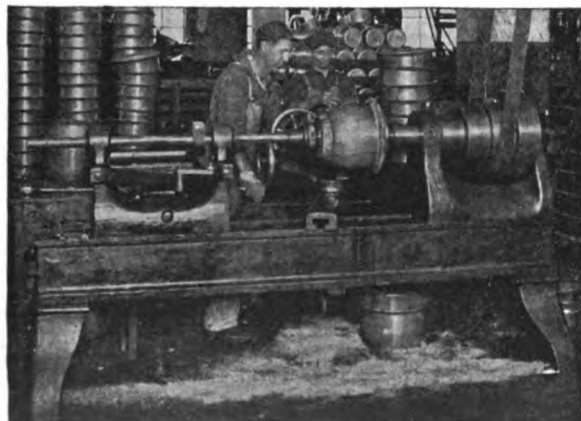
"BLISS" GANG SLITTERS

These machines are built in a large number of sizes for various widths and thicknesses of stock. The machine illustrated will trim sheets 32 in. in width and slit strips down to 2 in. in width. The machine is guaranteed to slit "dead true"



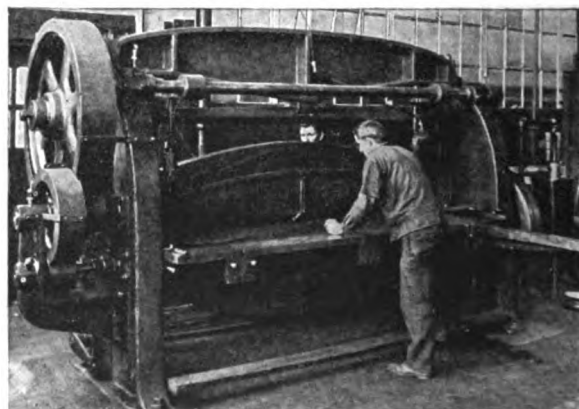
"BLISS" AUTOMATIC CAN BODY MAKERS

Shown with precision feed and roll solder attachment. One of a number of types and sizes covering a wide range of sanitary can production



"BLISS" SPINNING LATHES

Built in 7 sizes, are for spinning, burnishing, trimming and wiring the work produced in drawing presses



"BLISS" SQUARING AND TRIMMING SHEARS

Many styles and sizes. For cutting sheet metal up to 50 in. long by foot power, and up to 20 ft. long and up to 1/2 in. thick by power

SWEET'S CATALOGUE

Continued on next page

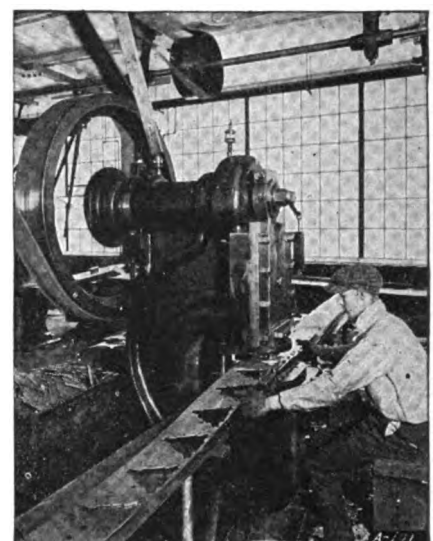


**"BLISS CONSOLIDATED" INCLINABLE
POWER PRESSES**

15 sizes, weighing from 275 to 12,000 lbs., either as "Flywheel" or "Geared" presses. Adapted for tin, sheet brass, sheet steel work, etc.



"BLISS" INCLINABLE POWER PRESSES
18 sizes, weighing from 500 to 8,000 lbs., either as "Flywheel" or "Geared" presses. Adapted for tin, sheet brass, sheet steel work, etc.

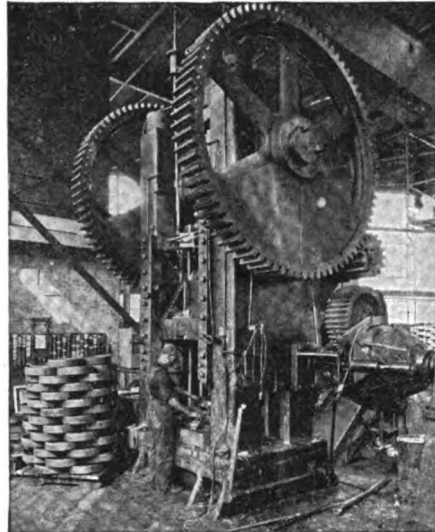


"STILES" PUNCHING PRESSES
11 sizes, weighing from 550 to 13,000 lbs. Adapted for the manufacture of general hardware, electrical goods, etc.



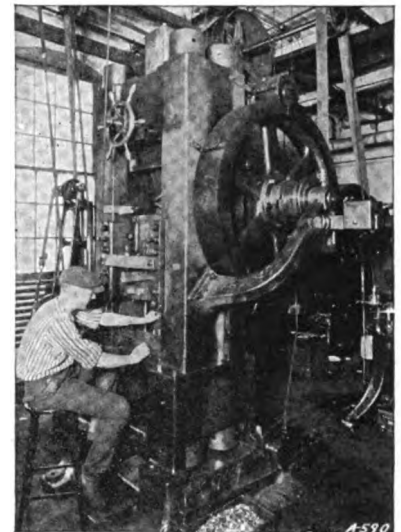
**"STILES" AUTOMATIC DROP HAM-
MERS**

15 sizes. Adapted for forging or stamping. Hammers weigh from 100 to 3,000 lbs.



"BLISS" STRAIGHT SIDE PRESSES

Built in a large number of sizes with solid and tie-rod frames, and weighing from 1,500 to 450,000 lbs. For heavy stamping, punching, cutting, piercing and trimming



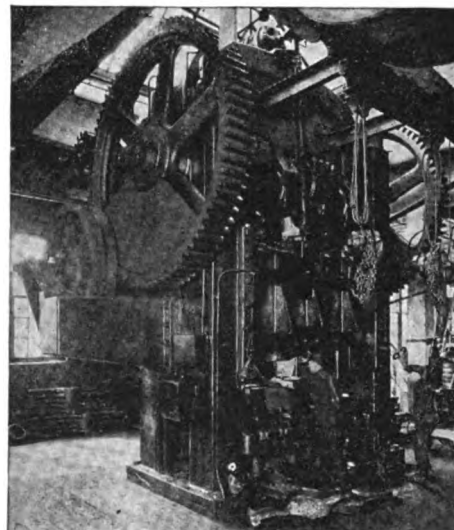
**"BLISS" KNUCKLE JOINT EMBOSSING
PRESSES**

9 sizes for pressures ranging from 100 to 1,500 tons. One-piece frames on smallest sizes. Built-up, tie-rod frames on largest



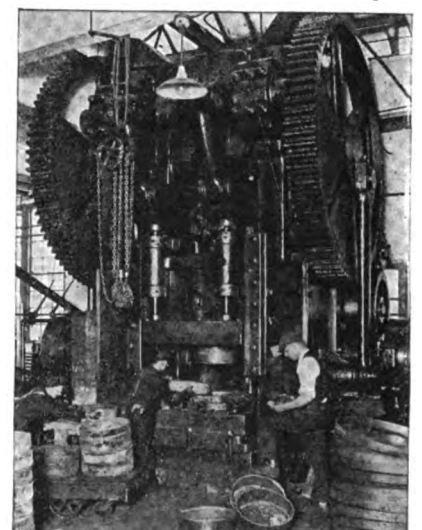
**"BLISS" DOUBLE CRANK TOGGLE
DRAWING PRESSES**

40 sizes. Adapted for heavy drawing and forming of large articles. Weighing from 15,000 to 550,000 lbs.



"BLISS" DOUBLE CRANK PRESSES

Over 150 types and sizes. Weighing from 3,000 to 600,000 lbs. Adapted for heavy stamping, punching, cutting, piercing and trimming of large dimensions



"BLISS" TOGGLE DRAWING PRESSES

Over 20 sizes, weighing from 5,000 to 300,000 lbs. For drawing shells from all kinds of sheet metal

BUFFALO FORGE COMPANY

Punches, Shears and Bar Cutters, Drill Presses, Forges, Woodworking Machinery

MAIN OFFICE AND PLANT
BUFFALO, N. Y.

Line handled by all leading jobbers in every city

COMPLETE LINE MADE IN CANADA BY
CANADIAN BLOWER & FORGE COMPANY, KITCHENER, ONT.

Products

"ARMOR PLATE" PUNCHES, SHEARS and BAR CUTTERS; made in all sizes from small hand power to largest shop requirement.

DRILL PRESSES: Complete line of hand and power drills, post and blacksmith drills.

FORGES: All sizes from the small jeweler's forge to the large railroad shop and forge shop equipment.

FORGE BLOWERS: Hand and electric.

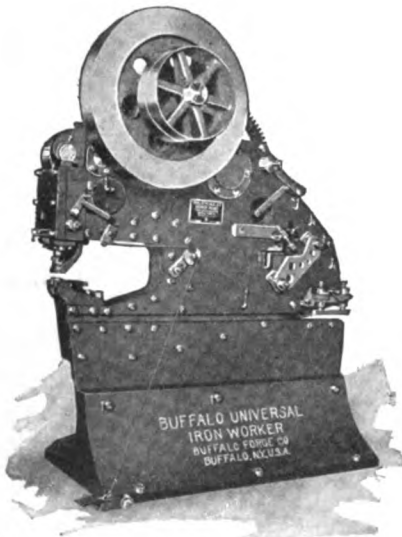
WOODWORKERS: Combination machines for all around woodworking. Suitable for body manufacturers and wagonmakers.

Also manufacturers of Bending Rolls for angles, tees, pipes and standard rolled steel shapes. Reboring Machines for automatic service.

For Heating and Ventilating Apparatus, see page 667.

Buffalo "Armor Plate" Punches, Shears and Bar Cutters

Buffalo "Armor Plate" Punches, Shears and Bar Cutters are characterized by their frame construction. Instead of bulky brittle cast iron or steel frames which



COMBINATION PUNCH, SHEAR
AND BAR CUTTER



COMBINATION
PUNCH AND
SHEAR

are unsatisfactory from every standpoint, "Armor Plate" frames are made of rolled steel plates and are absolutely guaranteed against frame breakage.

The "Armor Plate" line is complete from the small hand power machine to the large "Armor Plate" Universal which will handle every

punching, shearing, and bar cutting requirement of the largest steel fabricating shop.

Let us know the requirements and we will recommend the "Armor Plate" machine best suited for the purpose.

Buffalo Drill Presses

The Buffalo 20-in. drill is an all around machinshop tool. Sturdy enough for roughing work and yet capable of working to close limits. Will drill 1½-in. hole to center of 20-in. circle.

The Buffalo 418 wall drill is equipped with ball bearings and compound lever feed. Will drill a 1½-in. hole to center of 18-in. circle. Equipped for either hand or power drive.



POWER
DRILL



WALL DRILL

Buffalo Forges

The Buffalo 243-H forge is particularly suited for blacksmiths, contractors and garages where a practical all around forge is required. Regularly equipped with steel half hood, "Vulcan" tuyere and No. 200 Buffalo silent hand blower.

The Buffalo 94-D down draft forge is ideal for heavy duty. Built entirely of cast iron even to the down-draft hood, this forge is practically indestructible. Down-draft forges insure a clean gas-free forge shop.



BUFFALO 243-H
FORGE



BUFFALO 94-D DOWN-
DRAFT FORGE

Buffalo Forge Blowers

The Buffalo 2-E blower is the best electric forge blower made. Equipped with Universal motor and 6-speed rheostat it can be run from any lighting circuit.



BUFFALO 2-E
BLOWER

Buffalo Woodworker

The Buffalo No. 2 woodworker combines a band saw, rip and cross cut saw, a jointer, a sander, an emery wheel and a drill in one machine. This machine will handle all the requirements of the modern woodworking shop.



BUFFALO No. 2
WOODWORKER

Catalogues

Complete catalogues will be furnished on request.

ESTABLISHED 1879

NIAGARA MACHINE AND TOOL WORKS

Machines and Tools for Sheet Metal Working

Northland Avenue

BUFFALO, N. Y.

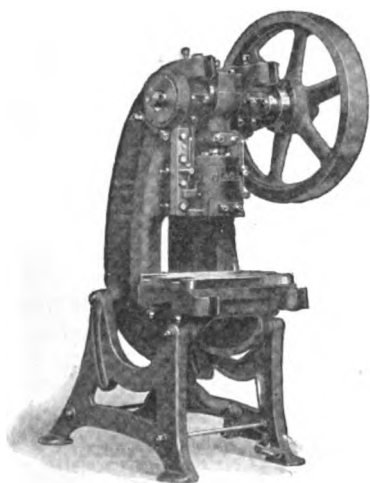
Products

PUNCHES; PRESSES; SHEARS; TINSMITHS' TOOLS and MACHINES, including Folders and Brakes, Bench Machines, Beading Machines, Bottom Flanging Machines, Forming and Curving Machines, Groovers, Seamers, Slip Roll Forming Machines, Shears, Snips, Roofers' Tools, etc.

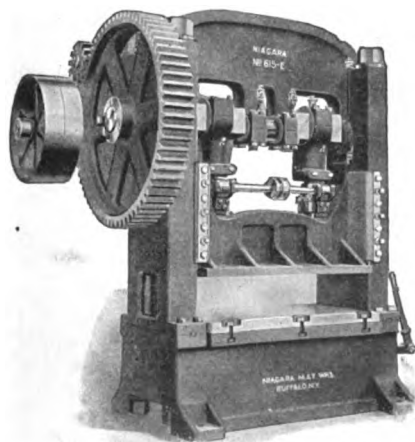
Punches and Presses

This company manufactures a great number of styles and sizes of punches and presses from small foot presses to large toggle, draw and double crank presses, some of the regular sizes weighing upwards of 100,000 lbs. This great variety of types and sizes includes presses for all usual and many special purposes.

Press catalogue No. 54 sent on request.



No. 5 INCLINABLE PRESS



No. 615E DOUBLE CRANK PRESS

NIAGARA

TRADE-MARK

Shears

The line of Niagara shears likewise includes a great number of sizes and designs.

Catalogue No. 55 describes

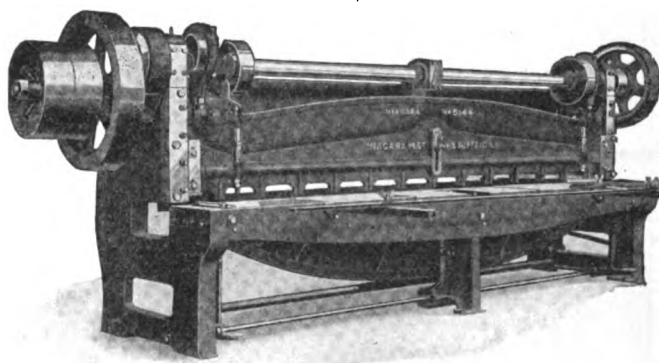
Niagara power squaring shears.

Catalogue No. 57 covers Niagara ring and circle shears and Niagara slitters.

Tinmiths' Tools and Machines

In catalogue No. 56 are illustrated the complete Niagara line of tools and machines for tinmiths and other sheet metal workers.

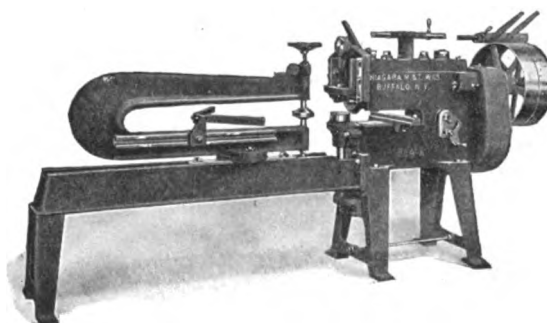
This line includes not only the heavier machines for cutting, forming and seaming sheet metal, but all of the lighter hammers, shears, stakes and various bench tools and machines.



No. 6144 SHEAR

Special Machines

The services of this company's engineering department, with its 40 years' experience in the manufacture of machinery for sheet metal working, are at the disposal of every manufacturer having sheet metal problems. This company has developed and built many machines for special purposes or has been able to adapt regular machines or batteries of them to special requirements.



No. 208A RING AND CIRCLE SHEAR

STANDARD ENGINEERING COMPANY

Manufacturers of Tube and Pipe Mill Machinery, Rolling Mill Machinery
ELLWOOD CITY, PA.

Products

TUBE and PIPE MILL MACHINERY: complete equipment for the manufacture of Seamless Tubes in Steel, Copper, Brass, etc.; also for the manufacture of Lap- and Butt-welded Pipe.

ROLLING MILLS: Sheet and Bar Mills for Rolling Steel, Copper, Brass, etc., both hot and cold.

CAST IRON ROLLS, sand and chilled; **ROLL LATHES.**

COLD DRAWING and FINISHING MACHINERY for Tubes, Bars, Rods, etc., consisting of Draw Benches, Straighteners, Pointers, Shears, Saws, etc.

PIPE THREADING and CUTTING MACHINES.

Facilities

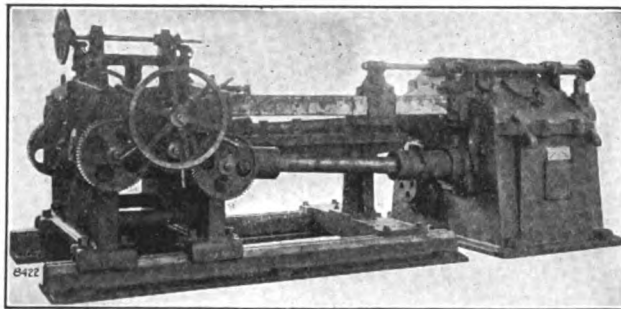
Our well equipped plant is located in the Pittsburgh district, the center of the iron and steel industry of America, and thus offers unusual facilities for keeping in touch with the latest developments along the lines of the machinery we manufacture.

Engineering Service

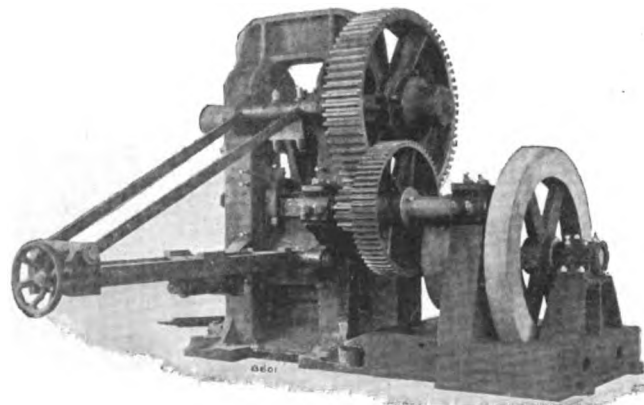
We have specialized for many years in the design and manufacture of the products listed above and offer the services of our highly trained engineering corps as an aid in solving the problems of prospective purchasers. Upon the receipt of requirements, they will submit recommendations, specifications and estimates.

Seamless Tube Mill Machinery

Included in this class of machinery are piercing machines of various types and sizes, rolling mills, expanding machines, sizing machines, reducing machines,



PIERCING MACHINE FOR STEEL, COPPER OR BRASS TUBES



6-IN. "STANDARD" HOT BLOOM SHEAR

cooling tables, the necessary conveyors and the operating valves. We also manufacture the guides, plugs and other operating equipment.

Our best claim as to our success in the manufacture of this class of machinery lies in the fact that practically every manufacturer of seamless tubes in the United States, Europe and Japan uses our product.

Butt- and Lap-welded Pipe Mill Machinery

We build all of the machinery necessary for the manufacture of either of these classes of pipe as well as the operating equipment. We also build complete coupling shop equipment for all sizes of pipe couplings.

Rolling Mill Machinery

Our rolling mills are built along the latest and most approved designs. We also manufacture rolling mill machinery such as squaring shears, doubling shears, doublers, bloom shears, etc.

We are equipped to make sand and chilled cast iron and semisteel rolls. We build a line of roll lathes comprising seven sizes to turn rolls up to 48 in. in diameter.

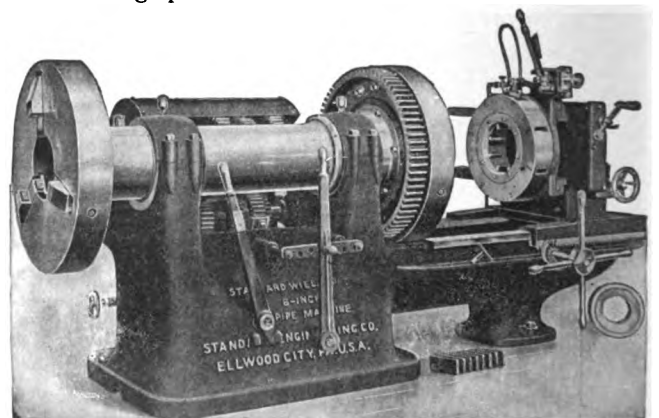
Cold Finishing Machinery

Included in this class of machinery which we build for the manufacture of tubes, rods, bars, etc., are double and single chain draw benches, hydraulic and electrically driven push benches, roll and press type straighteners, shears, bar pointers, cutting-off machines, etc.

Pipe Threading and Cutting Machines

In connection with pipe and tube mill machinery we have developed a complete line of threading and cutting machines. This line comprises nine sizes to thread from $\frac{1}{4}$ to 20 in. pipe inclusive. The chasers are extra wide, allowing for repeated regrinding of the entrance and for the cutting of extremely long threads as required for oil country service.

These machines are built in both the "mill type" design for use in pipe mills, and with radially expanding chasers generally preferred for jobbing work. Either design can be furnished for motor or belt drive; in the latter case a complete countershaft is supplied. Optional features of the "mill type" machines include air operated chucks and grips and automatic dies.



6-IN. "STANDARD" PIPE THREADING MACHINE

SOUTHWARK FOUNDRY AND MACHINE CO.

Manufacturers of Hydraulic Machinery and Power Tools

PHILADELPHIA, PA.

BRANCH OFFICES

CHICAGO, ILL., Fisher Building

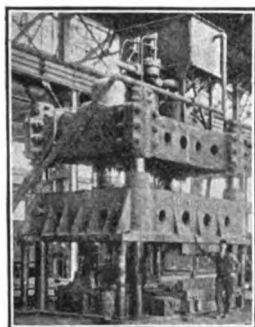
CLEVELAND, OHIO, Swetland Building

Products

HYDRAULIC MACHINERY and POWER TOOLS:

Gate Shears; Angle Shears; Multiple Punches; Forcing Presses; Drawing Presses; Flanging Presses; Plate Planers; Tile and Die Presses; Bending Rolls; Push Benches; Pull Benches; Riveters; Plate Bending Presses; Wheel Presses; Joggling Presses; Stamping

and Drawing Presses; Heater Presses; Forging Presses; Intensifiers; Dishing Presses; Washer Presses; Accumulators; Bending and Straightening Machines; Punching and Shearing Presses; Powder Presses; Flue Welders; Locomotive Repair Machinery; Scrap Reclaiming Equipment; Shipyard Machinery.

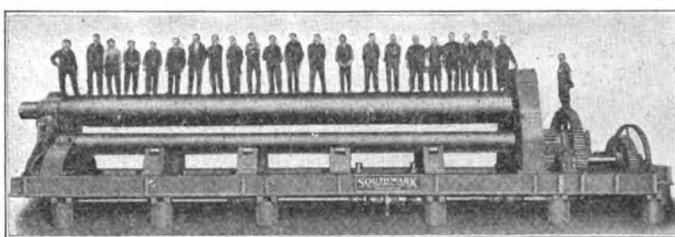


FLANGING PRESS

1200-ton, 3-cylinder triple power moving down hydraulic flanging and forming press, 8x12 ft. clear between 8-in. columns, 12x16 ft. tables, 6 ft. daylight stroke of ram 4 ft.

Southwark has built 4-column flanging, forming and forging presses in both the moving up and moving down types, in a wide range of sizes and capacities.

Standard designs readily altered to meet special requirements



BENDING ROLLS

Made in sizes from small sheets up to large ship plates 40 ft. long. Construction consists of 3 rolls, arranged in pyramidal setting. Two bottom rolls driven by suitable gear trains and electric motor, while top roll is an idler arranged for vertical adjustment through suitable screw down mechanism, generally driven by independent electric motor.

On all but large ship rolls, top roll is provided with an extension for balancing weight of roll; while removable outer bearing can be dropped for taking out completed shells. Roll can also be thrown out of parallel in a vertical plane with 2 lower rolls for handling conical sections.

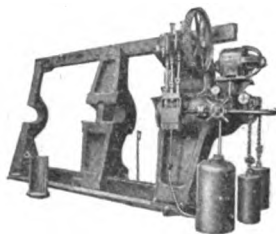
Housings and gear bearings mounted on continuous cast iron bed plates, which in turn are set on suitable concrete foundation



ACCUMULATOR

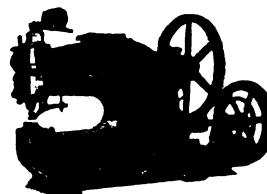
60-in. ram, 20-ft. stroke, 2940 gals., 600 lbs. per sq. in.

Furnished either moving cylinder or moving ram type of any capacity or pressure



600-TON HYDRAULIC DRIVING WHEEL PRESS

Inclined type. Pump body of forged steel mounted on heavy cast iron base plate. Equipped with axle bushing and stop plate. Belt or motor drive. All sizes and capacities



POWER PUNCH

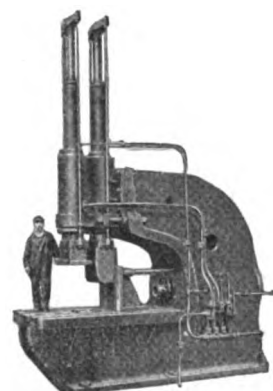
Improved design for long continuous service, speed, safety and ease of operation. Sizes from No. 1 to No. 12 with plain or architectural jaws. Capacities, holes from $\frac{1}{4} \times \frac{1}{4}$ in. up to 3x3 in. Equipped with angle shears, bar shears, etc.



150-TON STATIONARY RIVETER

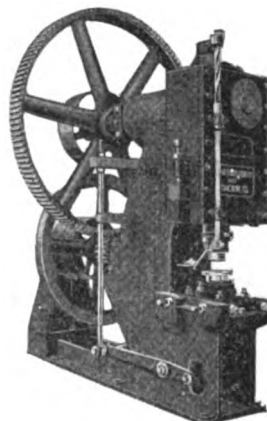
Single power. All rams outside packed, stuffing boxes easily accessible. Pull-back operated by constant pressure, while main ram is controlled by standard piston type 3-way operating valve.

Built in capacities from 15 to 60 tons with gaps from 6 in. to 12 ft. 6 in. Standard opening between stakes, 24 in. Triple- and six-power. Solid, split stake type. Capacities up to 200 tons with gaps to 25 ft.



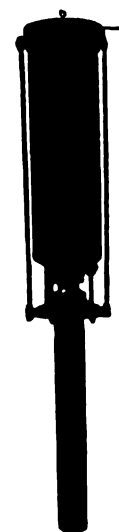
200-TON SECTIONAL FLANGING PRESS

Complete with operating valves. Designed for 1500 lbs. pressure. Equipped with 2 vertical, 1 horizontal and 1 supplementary ram. Semisteel housing. Cylinders of steel castings cast separately. Rams of special close grained cast iron mixture



MASON WASHER-MAKING PRESS

Trebles value of plate scrap. Makes a washer at every stroke, each perfectly flat and concentric, with clean-cut edges. On old tubes and flues 2 washers are made at one stroke. Punched washers are thrown into a box by a mechanical hand operating from plunger. This press can also be used for stamping, punching, shearing, etc. Send for special circular



TIRE HEATER PRESS

Tension rods take the strain, leaving tank subject only to steam pressure. Thinner shell heats more quickly and consumes less steam. Cooling water entering at top saves time at each cure. Instead of turning heavy top, press is easily and quickly opened by turning latch ring. Placing confined rubber packing around periphery prevents the cover from twisting the packing and pulling it out of place. Outside ram packing prevents flooding of heater during cure. More than 800 now in use. Built in all the standard sizes

AMERICAN GAS FURNACE CO.

Specialists in the Use of Gas for Mechanical Heating Processes

OFFICE AND FACTORIES

ELIZABETH, N. J.

Products and Services

FURNACES, Oven, Cylinder, Melting, Soldering, Soft Metal, Muffle, Assay Cupelling, Annealing, Oil Tempering, Brazing-tables; AUTOMATIC HEAT CONTROLLERS; CARBONIZING MACHINES; HEATING MACHINES; GAS BLAST FORGES; GAS BLAST RADIATORS; POSITIVE PRESSURE BLOWERS.

Also manufacturers of Automatic Quenching Tanks; Gas Boosters; Brass Melters; Burners; Burners for Electric Lamp Bulb Manufacture; Cyanide, Plating, Sweep Reducing, Tube Heating, Furnaces; Forges for Glass Bending; Hardening Hammers; Rivet Heaters; Tempering Plates; Tire Heaters, and every type of Gas Blast Burner; Furnace and Heating Machines for all Ordinary or Special Industrial Uses.

GAS ENGINEERS.

Scope of Use

These products are applicable to all heat treating processes requiring precision.

Gas as Fuel

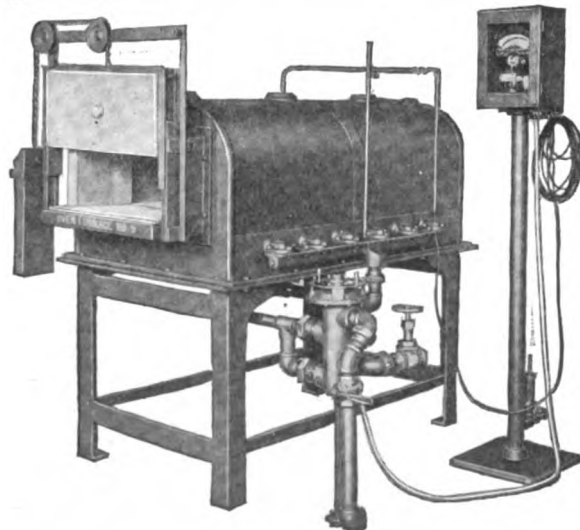
After an experience of over 40 years in utilizing gas in mechanical heating processes and operations, we find no fuel possesses so high a degree of efficiency. A positive air blast inducts the gas which is injected into combustion chamber—a properly proportioned mixture of both, *under absolute control*.

Natural, artificial or producer gas can be used with all our appliances and has proved the best and the cheapest in net results.

Automatic Heat Controller

Gas blast furnaces operated with this heat controller will not vary more than 10° Fahr. from any temperature to which instrument is set. Controller consists of 2 parts:

(1) Pyrometer arranged so that dial pointer movement indicates and controls tem-



HEAT CONTROLLER, CONNECTED TO OVEN FURNACE
Furnaces made in various sizes

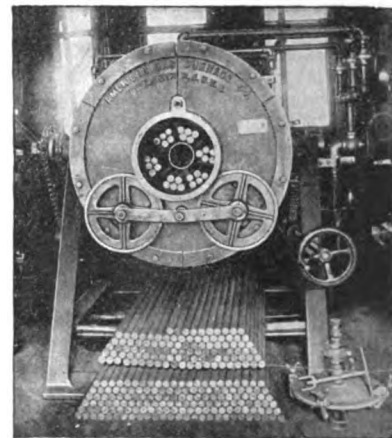
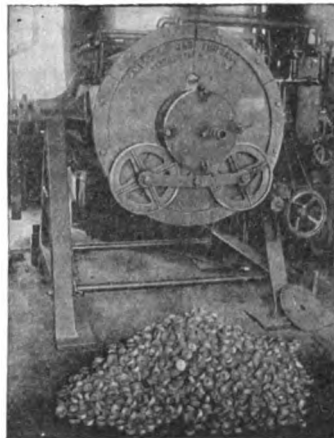


perature. (2) Pneumatic valve attached to furnace, operated by same air pressure as supplied to furnace for combustion admits both gas and air in correct proportion to maintain temperature required, thus effecting a considerable saving in gas and maintenance, assuring uniform results.

A Case Hardening Plant

In case hardening, first operation is to *carbonize* exterior of work so it can be *hardened*; second, the hardening process. Plant consists, therefore, of a carbonizing machine, which may be used also as a reheating machine, or a separate reheating machine placed according to available space, and quenching tank.

New Process Carbonizing—By this new process of carbonizing the surface of wrought iron or low carbon steel is converted into high carbon steel to any practical depth required for case hardening the exterior uniformly and leaving a soft core.



CARBONIZING MACHINES

Built in different sizes to handle materials in bulk or pieces, and when necessary proper fixtures can be supplied for holding work firmly in retort

In this machine the work is packed in gaseous instead of solid carbon. With this process, city or natural gas is the carbonizing agent.

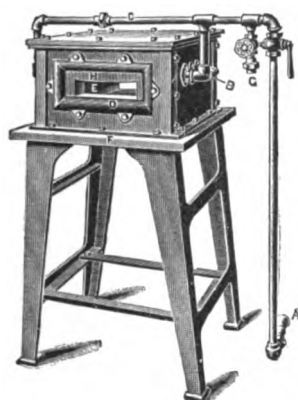
Carbonizing Process—Work contained in the evenly heated, slowly revolving cylindrical retort is constantly and uniformly exposed to a carbon-charged atmosphere, and absorption of carbon begins as soon as work is sufficiently heated to attract it *without the use of old style solid carbons or packing in boxes*.

However, if so desired, rotary carbonizing machines, using solid packing compounds *without boxes*, can be furnished. These machines have the great advantages of constantly mixing work and compound, maintaining uniform heat, all articles in retort reaching carbonizing temperature simultaneously, and reloading while red hot.

Gas Furnaces and Heating Machines

Gas Blast Forges—Will develop required heat in a few minutes. Used in machineries for tool dressing and forging, drop forging, etc.

Types—Bench forges, for forging and hardening small tools or small pieces of metal; tool room forges, for drop forging, for heating blanks of various lengths,

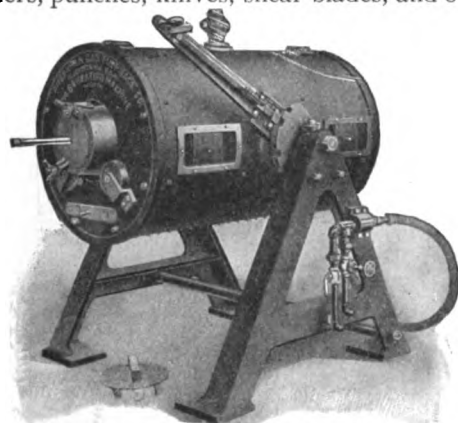


FORGE FOR DRESSING TOOLS,
ETC.

shafts, long blades, etc. Made in various sizes.

Tempering Machines—For drawing temper after hardening.

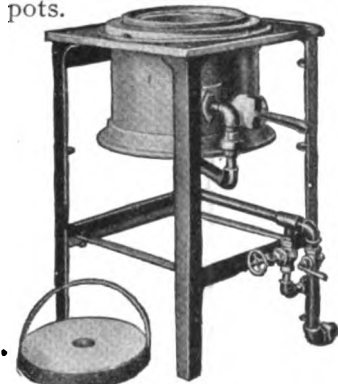
Types—Oil tempering, designed to heat oil or tallow not exceeding 600° Fahr., and to control temperature so as to draw any desired temper required in dies, cutters, punches, knives, shear blades, and other cut-



HEATING MACHINE NO. 64

For tempering and coloring steelwork. Made in various sizes. ting tools; air tempering, used to draw "spring temper" and for all work which must show a temper color—air being injected into heating chamber and heated to any required degree, then forced into working space under positive pressure. Where temperature exceeds 600° Fahr., hot air coloring and tempering machines made in various sizes to meet different requirements are recommended; also recommended for "carbonia" (or gunmetal) finish.

Melting Furnaces—For crucibles and cast iron pots.



LEAD HARDENING FURNACE
For hardening or tempering
in lead.

Muffle Furnaces—For enameling and assaying. Muffles necessary only when work is such that products of combustion must be excluded from heating chamber containing the work, or when air draft through heat-

ing space is required. Muffles not necessary for metal work. Muffle enclosed by a fire-clay chamber. Burners project into combustion chamber horizontally from opposite sides and force flame into space surrounding muffle, causing its equal distribution.

Oven Furnaces—For annealing and hardening; die hardening furnaces; case hardening furnaces.

Cylindrical Furnaces—For annealing, hardening and carbonizing.

Types—Round annealers, for wire and light stock, coiled; circular, for heating large rims, rings, disks, dies and other circular steel blocks; for hardening rolls, shafts, long blades, etc. Made in various sizes.

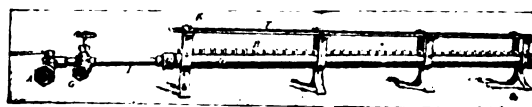
ing space is required. Muffles not necessary for metal work. Muffle enclosed by a fire-clay chamber. Burners project into combustion chamber horizontally from opposite sides and force flame into space surrounding muffle, causing its equal distribution.

Assay Cupelling Furnaces—For assaying, cupelling and scorifying—built on plan of our other muffle furnaces, with air draft through muffle.

Annealing Furnaces—For bars, rods, strips and pipe. Made to order, of any desired size.

Brazing Tables and Furnaces—Convenient forges for brazing joints in various positions. Blow-pipes pivoted and hinged so as to be easily adjusted to any desired angle or height. Rim brazing furnace, for brazing tires, rims and similar work.

Gas Blast Radiators—For japanning or enameling ovens. Illustration shows burner for japanning ovens, core ovens, drying kilns or heating of any enclosed cubic space which may be specified; radiator used ex-



GAS BLAST RADIATOR NO. 3

clusively for work which does not emit fumes or gases liable to be ignited from open burners. Positive pressure of air is necessary. Enclosed burner for indirect heating also manufactured.

Heating Machines—Furnaces provided with carrier devices for automatic transmission of work through uniformly heated space, for hardening, annealing, brazing and tempering uniform size work in quantities.

Kind of Work Treated—Lock washers, bolts, springs, pens, cups, cones, ball bearings, etc., for hardening or annealing. Pencil ends, ferules, grease cups, cartridge shells, etc., for annealing.

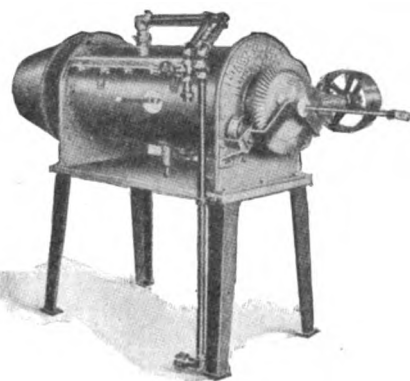
Adjustable Tire Heaters—

For expanding tires for shrinking same on wheels; readily adjustable to different sizes.

Positive Pressure Blowers—Made in 7 different sizes. An air blast under an average pressure of 1 lb. to the sq. in. is indispensable for the operation of all American furnaces and heating appliances. Proper blast can best be applied by this type of blower.

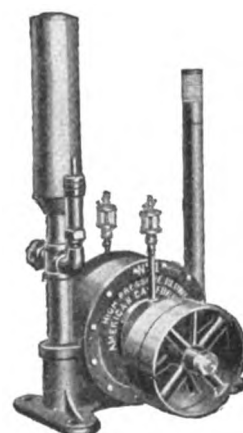
Other Furnaces and Heating Machines—The AMERICAN GAS FURNACE CO. manufactures many other kinds of appliances to meet special requirements.

When Ordering—State fully all conditions and requirements. Full particulars on application.



CONTINUOUS HEATING MACHINE

For hardening and annealing, work passing through a uniformly heated retort. Discharges automatically. Made in various sizes



POSITIVE PRESSURE
BLOWER

THE HAGAN CORPORATION

Combustion Engineers

PITTSBURGH, PA.

Products

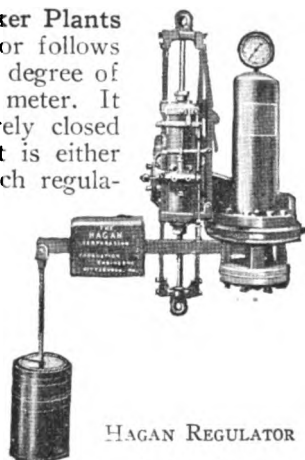
HAGAN SYSTEM of COMBUSTION CONTROL: Regulating Equipment, Damper Regulation, Pressure Regulators, Regulating Equipment for Special Purposes; HAGAN DE-CONCENTRATOR; HAGAN REFRACTORY IRON CASTINGS.

Combustion Control Apparatus

For Forced Draft Stoker Plants—The Hagan system coordinates the stoker speed, fan speed and draft in accordance with steam demand—not pressure changes. This system is installed in some of the finest plants in America with excellent results.

For Natural Draft Stoker Plants—The Hagan master regulator follows the plant load with the same degree of accuracy as an indicating flow meter. It is never wide open or entirely closed unless the load on the plant is either maximum or minimum. Such regulation, which can only be secured by Hagan apparatus, materially increases efficiency, decreases upkeep cost of stokers, arches and settings, and produces a decided improvement in general plant operation.

For Blast Furnace Gas Fired Plants—A special system for maintaining a definite relation between air supply, gas supply and draft. Results secured by some of the big steel companies and checked by one of the largest boiler manufacturers can be cited to those interested.



HAGAN REGULATOR

Special Regulating Equipment

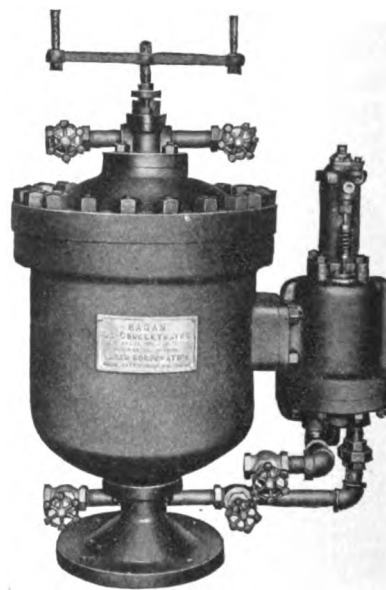
Our Engineering Department is continually asked to analyze special regulating conditions in connection with the control of blast furnaces, stoves, coke ovens, metallurgical furnaces, etc., and to recommend the proper equipment.

Hagan De-Concentrator

To understand the principles of the Hagan De-Concentrator, consider the following facts:

As the temperature of the water rises, it loses its power to hold in solution certain scale-forming matter which it contained when cold. *The higher the temperature, the better the precipitation.* The water, thus purified, is evaporated and replaced with raw water. After a certain period of operation, the water in the boiler becomes highly concentrated and the impurities crystallize. The circulation of the boiler causes these crystals to impinge upon one another and facilitates their building into particles of sufficient size to settle on the heating surfaces. Scale is not deposited in the tubes and drums until the water in the boiler has reached a definite point of concentration. The problem is to prevent this point being reached.

The Hagan De-Concentrator is a special combination of pump and filter accomplishing this in the simplest manner possible. It automatically and continuously removes the concentrated solution from the boiler; filters it and returns it—"deconcentrated"—to the boiler. Each 24 hours the filter is flushed back and the impurities, precipitated by the temperature in the boiler, are washed to the sewer instead of being allowed to insulate the heat absorbing surfaces.



HAGAN DE-CONCENTRATOR

Hagan Refractory Iron

A special foundry product developed after years of research to meet the following requirements:

Grinding balls and liners for tube mills and ball mills; bin and chute linings; annealing pots; furnace castings; grizzly discs; bars for coke screens and crusher rolls, sintering tables, and plates.

This metal is deserving of consideration where excessive abrasion is to be resisted and where high temperatures are to be encountered.

The Hagan foundry is devoted exclusively to the manufacture of this metal.

References

A representative list of organizations who have investigated and recommended "Hagan Regulation":

D. P. Robinson & Co.	Walter Kidde & Co.
Stone & Webster	Carnegie Steel Co.
Sanderson & Porter	American Sheet & Tin Plate Co.
Dupont Engineering Co.	American Steel & Wire Co.
Foundation Co. of America	National Tube Co.
Geo. S. Rider Co.	West Virginia Pulp & Paper Co.
Samuel E. Discher & Sons	A. R. Burnett
Day & Zimmerman	Jones & Laughlin Steel Co.
John A. Stevens	Pennsylvania Railroad Co.
Westinghouse, Church, Kerr & Co.	Ford Motor Co.
Clark, McMullen & Riley, Inc.	American Telephone & Telegraph Co.
J. G. White Engineering Corp.	
Lockwood, Greene & Co.	

THE GEORGE J. HAGAN CO.

Furnace and Combustion Engineers

Peoples Bank Building
PITTSBURGH, PA.

Products

FURNACES; INDUSTRIAL FURNACES for all purposes, especially:

Annealing Furnaces, Periodic and Continuous types, for annealing strips, bars, steel castings, malleable castings, plates, sheets, wire, etc.

Heating Furnaces, Hearth and Continuous types, for rolling mills, sheet and tin plate mills, forge plants.

Tunnel Annealing Furnaces for annealing sheets, castings, malleable castings, etc.

Continuous Blue Anneal Furnaces for sheets.

Regenerative Furnaces, for heating and melting.

Crucible Furnaces.

Melting Furnaces.

FUEL BURNING SYSTEMS, for Liquid Fuels, Powdered Coal, Producer Gas.

Also manufacturers of Stokers and Gas Producers.



TRADE-MARK

Electric Furnaces

We maintain an electric furnace department who devote their entire attention to electric furnace applications. We have installed electric furnaces for steel hardening, carbonizing and annealing; non-ferrous metal annealing; enameling and similar metal heating operations.

The following bulletins describe the construction and operation of our electric furnace equipment. Any of these bulletins will be mailed on request:



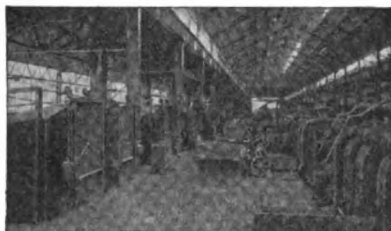
ROTARY ELECTRIC HEAT TREATING FURNACE

Service

THE GEORGE J. HAGAN COMPANY recognizes that it can best serve its clients by a service which is broad enough to cover the entire field of industrial heating. To this end we do not favor any particular type of furnace or any kind of fuel as we have built furnaces of all types and to be fired by all fuels.

Each inquiry received is treated as a separate problem by our engineering staff and proper recommendation is made to meet the existing conditions to the best advantage.

We make a specialty of designing and building complete furnace installations for entire plants, including the fuel distributing systems, thereby insuring that the minor details, often overlooked or ignored as unnecessary, are given the attention they deserve and avoiding the difficulties of divided responsibility.



VIEW IN THE LARGEST TIN PLATE PLANT IN AMERICA—HAGAN EQUIPPED

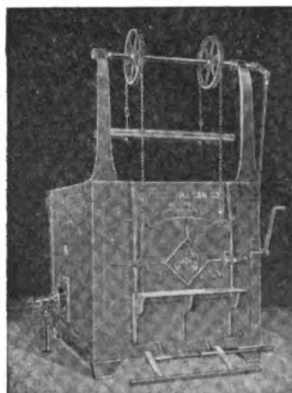


BATTERY OF HAGAN ANNEALING FURNACES

- Bulletin E. F. 1. Operating Costs of Electric Furnaces.
- Bulletin E. F. 2. Experience with Electric Core Baking.
- Bulletin E. F. 3. Heat Treating Machines of Precision.
- Bulletin E. F. 4. Standard Electric Furnaces for Steel Hardening, Carbonizing and Annealing, Non-ferrous Metal Annealing, Enameling and Similar Metal Heating Operations.
- Bulletin E. F. 5. Rotary Electric Furnaces.
- Bulletin E. F. 6. Regenerative Car Type Furnaces.
- Bulletin E. F. 7. Operating Data on Electric Furnaces.
- Bulletin E. F. 8. Hagan Enameling Furnaces.

Liquid Fuel Burning Systems

Our liquid fuel department is prepared to supply furnaces for any fuel that will flow; or equipment for properly handling, conditioning and delivering such fuels to the combustion equipment of a furnace. Applications made to steam boilers, metallurgical furnaces for the treatment of solid or molten metal, and other industrial furnaces of all kinds.



STANDARDIZED HEAT TREATING FURNACE—OIL, GAS, ELECTRICITY

Ask for such of the following listed bulletins as will apply to your problem or write in detail if your problem is not specifically covered in the bulletins listed.

Bulletins L. F. 101. Oil Equipment for Open Hearth and Regenerative Furnaces.

Bulletins L. F. 102. Oil Burners for Industrial Furnace Application.

Bulletins L. F. 103. Oil Application to Steam Boilers.

Bulletins L. F. 104. Auxiliary Apparatus.

Bulletins L. F. 105. Combustion Type Standardized Furnaces.

THE PAUL MAEHLER COMPANY

Manufacturers of Ovens for Japanning and Enameling

TELEPHONE
SEELEY 7541

2210-2214 West Lake Street
CHICAGO, ILL.

REPRESENTATIVES

DETROIT, MICH., BEEMAN & BROUGHTON
Co., 458 21st Street

CLEVELAND, OHIO, W. H. KELSEY & Co.,
Fidelity Mortgage Building

ROCHESTER, N. Y., R. C. SCHWARZ,
921 Granite Building

Products

Ovens for Japanning, Enameling, Drying, Core Baking, Annealing, limited to temperatures of 1000° Fahr.

Also manufacturers of Japanning Room Equipment in connection with oven installations.

Maehler Ovens

Maehler ovens are constructed for hand, truck, or monorail and conveyor loading; or in any special type. They are made for use with indirect and direct gas, electricity, steam, or fuel oil.

The Maehler oven and its patented construction features are the result of careful study of oven requirements, combined with practical knowledge of japanning room conditions obtained by intimate contact. THE PAUL MAEHLER COMPANY guarantees this oven, built in any type desired, to eliminate fume, smoke and excessive heat radiation factors in the japanning room, by its heating system to minimize fire and explosion hazards, and by superior ventilation and circulation methods to produce superior baking results at lower unit cost.

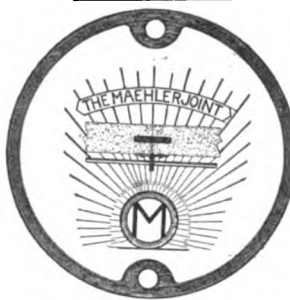
The wall construction is designed as a sectional panel type with standardized panels, joined by flexible, non-conductive joints, with no metal contact at any point from the inner to the outer panel metal, eliminating heat leakage and radiation loss which cause hot spots on the surface. Panels and joints are of solid insulations, of the highest grade procurable, and by their composition and application remain in their original position for the life of the oven.

Doors are also of the non-through metal contact type, and are hinged within steel framework, independent and with no strain on the oven walls. Doors close upon an elastic asbestos seat, eliminating smoke and fume leakage, regardless of oven baking speeds.

Floors are also of the panel construction and insulated to 2½-in. or 4-in. thickness with same insulating material. Channel guides and rails are included for truck loading oven types.

Low temperature applications, 2½ in. of Nonpareil or Silocel blocks, or Johns-Manville Asbestocel blocks.

High temperature applications, 4 in. to 6 in., inclusive, of Nonpareil or Silocel insulating blocks.



TRADE-MARK

Smaller types of ovens are ventilated by natural draft; the larger by mechanical draft created by direct connected motor fan units, connected to upper and lower oven vents. Our direct connected fan feature eliminates any hazard due to belt slippage or breakage, and constant attention and vibration.

We manufacture our own burner equipment. Our pressure burners using boosted gas are guaranteed everlasting and turn down from 27 in. of pressure to 3 in. without backfire.

Accessory Equipment

General Electric or Westinghouse electric heating equipment

Brown recording thermometers

Robertshaw and Bristol temperature controllers

Leeds & Northrup and Tycos electric controllers

Sherwood and Crawford regulators

American Blower Company fans

Roots gas pumps

"Service" roller and ball bearing casters

Link-belt conveying chain

Electric ovens are furnished complete with heating units, switchboards and incidental appliances, as listed.

Shipment

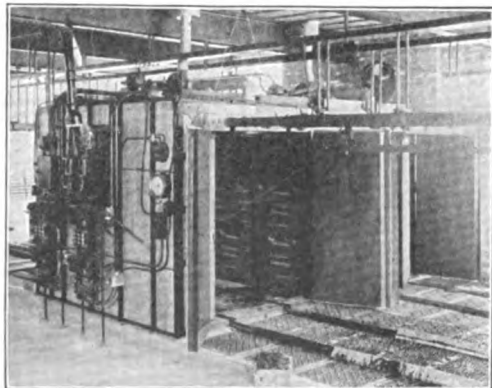
We ship ovens knocked down, with erection blue print instructions or erect at any point in the United States and Canada.

Service

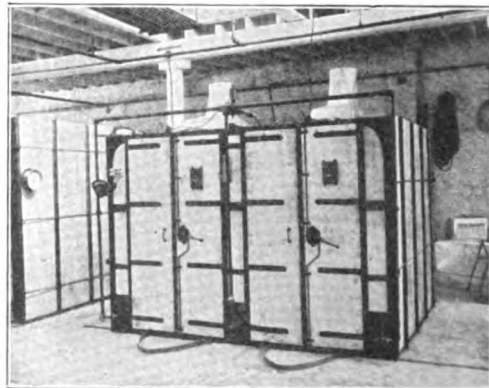
Our engineering staff is equipped to submit data and proposals on ovens and japanning room and foundry oven accessories and we accept complete installations of this nature. We have standardized on the highest grade oven accessories manufactured in the United States, insuring high grade service from the makers and standard replacements in case of breakage.

Literature

We issue and will submit on request detailed illustrative and descriptive data of all types of ovens we manufacture, in General Catalogue B 2; Constructional Features Bulletin B 21; Direct and Indirect Gas Ovens Bulletin B 22; Electric Ovens and Electricity Bulletin B 23; Conveyor and Special Ovens Bulletin B 24; Core Baking Ovens Bulletin B 25.



ELECTRICALLY HEATED OVEN



GAS HEATED OVEN

PARKS-CRAMER COMPANY

General Agents for the Merrill Process of Industrial Heating

1102 Old South Building

BOSTON, MASS.

WORKS: FITCHBURG, MASS., AND CHARLOTTE, N. C.

Products

MERRILL PROCESS OF INDUSTRIAL HEATING. (Patented Jan. 1, 1918, Sept. 3, 1918, and other patents pending and applied for.)

For Air Conditioning Equipment, see page 684.

Merrill Process

This is an apparatus for supplying heat at high temperatures for industrial processes, and conforms to certain general requirements which may be briefly stated as follows:

The temperature range of the heating medium exceeds that of the material being heated, to insure a rapid transfer of heat. In other words, there is ample thermic head.

The apparatus is safe and durable. Damage from excessive pressure and danger from explosions or fire hazard have been avoided.

The temperature and the rate of heat transfer are under quick and positive control at all times.

A special, non-explosive fluid, mechanically circulated, passes through a scientifically constructed heat absorber. Thence it is delivered through pipes to the apparatus to be heated—jacketed kettles, oven coils, stills, tanks, etc. After delivering a certain predetermined portion of its heat, the circulating fluid returns through the pump to the absorber for re-heating. The entire system is under a slight static pressure from an expansion tank, open to the atmosphere. The only added pressure, rarely exceeding 5 lbs., is that required to maintain circulation against internal frictional resistance.

The absorber and fuel supply may be located at any reasonable distance from the manufacturing apparatus—completely isolated in a fireproof room if the product is inflammable. All fire risk is thus avoided. There is no explosion hazard from the circulating fluid.

The circulating fluid is of the first importance. A special mineral fluid free from carbon is used; also free from inflammable distillate or vapor pressure. Its copyrighted name is Meproline. It has a safe working temperature of 600° Fahr. With dry saturated steam, a pressure of 232 lbs. per sq. in. is reached at only 400° Fahr. Superheating may carry this temperature higher, but is of little use for industrial heating on account of its low specific heat and its inefficiency due to the loss of the latent heat of vaporization.

Meproline will stand most severe flash and fire tests. It withstands high temperatures for indefinite periods. It does not carbonize, distill or "crack." It is made especially for the Merrill Process and is sold only for it.

Absorber

Peculiar requirements for transferring heat, not found in other engineering construction, necessitated long experimenting and careful design. The absorber coil rests on a Dutch oven furnace especially designed for

the type of fuel used. Expansion strains and radiation losses are amply provided for. Insulated clean-out doors provide proper accessibility. The low pressure fuel oil burners prolong the life of furnace linings.

The absorber coil is a series of tube elements expanded into nested return elbow units. Compact in construction, efficient in distribution of heating surface, easy of examination and repair.



A 600,000 B. T. U. PER HOUR ABSORBER COIL

Circulating Plant

Proper design of the circulating plant is of vital importance. The pump must circulate, without pulsation, a material which when cold is extremely viscous, and when hot is more fluid than water and more difficult to confine. Ample safety devices are installed to protect all parts of the system against unintelligent operation.

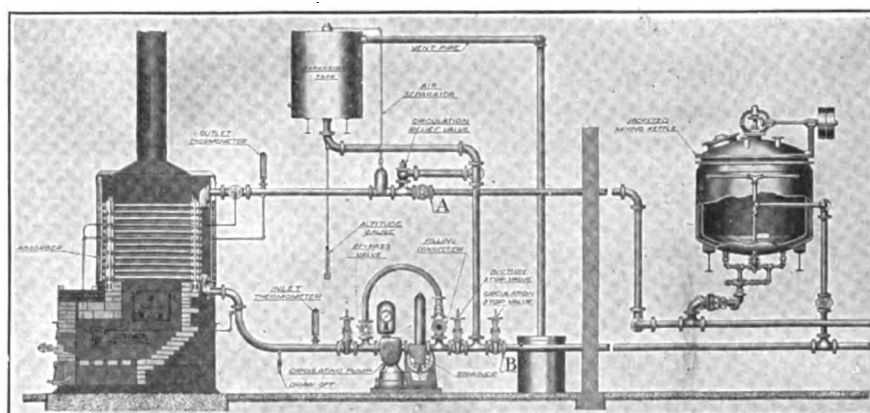
Applications

The Merrill Process began in the asphalt-using industries six years ago. Its early apparatus, relating to road construction, is still in use. The system as now developed, however, is applicable to the following industries:

Chemical plants, rubber works, asphalt melting and coating plants, melting and refining works, oven heating, japanning plants, paper coating mills, canning factories, shoe shops, plants using hot calender rolls or presses, varnish, paint and shellac works.

Each case is a separate engineering problem. On request, preliminary data sheets will be furnished, from which tentative estimates may often be submitted. These must invariably be checked later by a personal inspection of local conditions before a definite contract price can be quoted. Parks-Cramer engineers are always available for consultation.

Installations require specially trained mechanics, hence must invariably be made by the construction force of this company.



TYPICAL MERRILL PROCESS SYSTEM CONNECTED TO A LARGE JACKETED KETTLE

WHITING CORPORATION

FORMERLY WHITING FOUNDRY EQUIPMENT CO.

15611 Lathrop Avenue

HARVEY, ILL.

REPRESENTATIVES IN 25 PRINCIPAL CITIES

Products

Designers and manufacturers of FOUNDRY EQUIPMENT; RAILWAY SPECIALTIES.

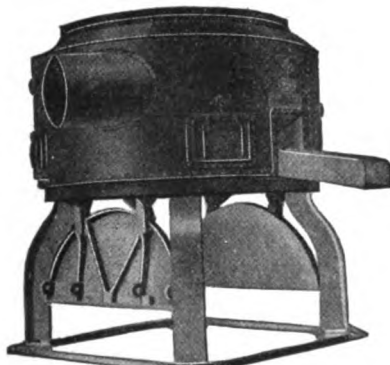
For Cranes, see page 794.

Foundry Equipment

We design, equip and start into operation complete foundry plants for various classes of work: Gray iron, car wheel, malleable iron, converter steel and brass. Typical layouts, lists of equipment recommended, specifications, etc., furnished on request. Send for our illustrated booklet "Foundries: Their Complete Equipment."

Whiting Cupola

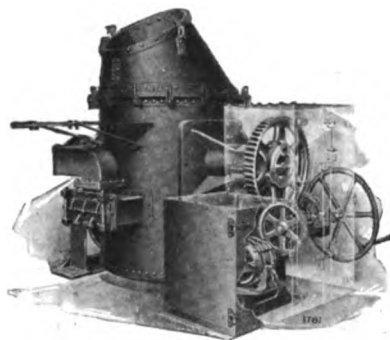
The standard iron melter. Heavy substantial construction throughout. Efficient blast distribution. When properly operated we guarantee hot fluid iron at rated capacity. Special design for continuous melting. Over 3800 sold.



BODY SECTION OF STANDARD CUPOLA

CUPOLAS

No.	Capacity per hour, tons	Diam. of shell "A," in.	Diam. inside lining, in.
0	$\frac{1}{4}$ to $\frac{1}{2}$	27	18
1	$\frac{1}{2}$ to 1	32	23
2	1 to 2	36	27
2½A	1 to 2	41	27
2½B	3 to 5	41	32
3	3 to 5	46	32
3½	5 to 6	51	37
4	6 to 7	56	42
5	7 to 9	63	45
6	9 to 10	66	48
7	10 to 12	72	54
8	12 to 14	78	60
9	14 to 18	84	66
9½	18 to 21	90	72
10	21 to 24	96	78
11	24 to 27	102	84
12	27 to 30	108	87



CONVERTER

Whiting Side Blow Converter

Ideal for small steel castings and intermittent work, although castings of 2 tons or more can be poured by accumulating several heats. Adapted for special mixtures and alloy steels. 1- and 2-ton capacities.

Malleable Furnaces

The Whiting air furnace for making malleable iron castings is inexpensive to install and maintain, compared with other processes. Can be started up or closed down with small loss. Standard designs for 6-, 10- and 15-ton capacity per heat. Complete equipment furnished, including annealing ovens, ladles, tumblers, cranes, etc.

Brass Furnaces

Stationary type for use with natural or forced draft. Four standard sizes: 90-, 150-, 270- and 600-lb. capacity. Also crucible tongs, pick-up tongs, and wet or dry tumblers for brass work.

Sand Cutting and Screening Machine

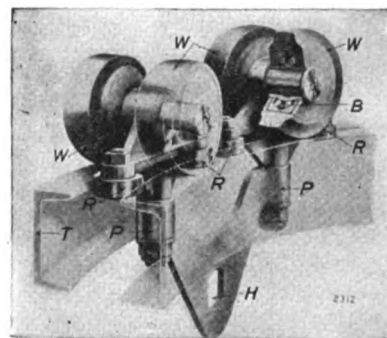
The Whiting sand cutting and screening machine cuts, aerates, screens and tempers moulding sand at one operation, under control of one man. More uniform results than with hand methods, resulting in fewer defective castings. Possible to save \$10.00 per hour.



SAND CUTTING AND SCREENING MACHINE
(Patents applied for)

"Short-turn" Overhead Trolley Systems

For use in any foundry, shop or warehouse. Trolleys run as easily on 18 in. radius curves as on straight track. Direct, labor-saving. Standard capacities: 500 to 6000 lbs. We also make standard I-beam trolley systems in capacities of 500 to 10,000 lbs.



"SHORT-TURN" TROLLEY
(Patented)

W—Wheels, no flanges; no friction. B—Bearings, double row for each wheel; smooth, easy running. R—Guide rollers, guide trolley. P—Pivots, permit wheels to turn on load line. T—Track, standard rolled channel or I-beam sections. H—Hoist connection; hang hoist in loop "H."

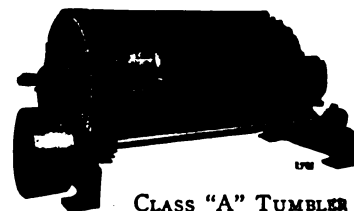
Tumbling Mills

Class A—Round, steel plate barrel arranged for exhaust. Low standards permit loading from either side. All parts extra heavy and durable; removable trunnions. For heavy duty. Belt or direct motor drive.

Class B—Square barrel, extra heavy steel plate reinforced by angles. For stove plate and frail work. Arranged for exhaust.

Class C—Round barrel with removable cast iron staves. Not suitable for exhaust.

Sizes—Standard diameters, 24 to 60 in.; standard lengths, 36 to 72 in.



CLASS "A" TUMBLER



CRANE LADLE WITH PATENTED HELICAL-WORM GEARING

Ladles

Crane Ladles—Shell plates, tank steel; bottom, best flange steel. Unless specified, open gearing supplied. Capacities up to 30 tons.

Crane Truck Ladles—Geared, in capacities from 1 to 6 tons; plain, from 1000 to 3000 lbs.

Standard Truck Ladles—Plain and geared in capacities from 1000 to 3000 lbs.; heavy

type, geared, from 4000 to 8000 lbs. capacity.

Shank Ladles—Capacities from 100 to 3000 lbs.

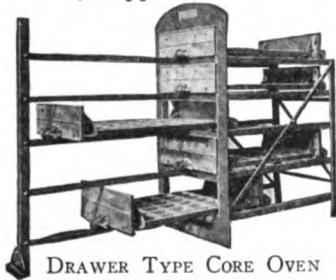
Hand Ladles—Capacities from 30 to 60 lbs.

Other Styles—Also bottom tap, teapot spout, car wheel and reservoir ladles.

"Safety First" Helical-worm Gearing—Our new patented helical-worm gearing is self-locking and makes the ladle absolutely safe, yet easy to operate. Gear alignment not affected by distortion of either bowl or bail; no "drop." Can be applied to old or new ladles of practically any make.

Core Ovens

Drawer Type—Drawers have rigid, braced frame, supported on three flanged wheels with roller bearings. Drawers may be pulled separately or together as desired.



DRAWER TYPE CORE OVEN (Patented)

Car Type—Arrangement of flues, dampers, etc., insures uniform heating and highest fuel efficiency. Give size required (width, length and height), number of shelves and location.

STANDARD ARRANGEMENT OF DRAWER OVEN FRONTS OR SECTIONS

Number of drawer		5	5	5	5	5	5	5	5	5	4	3	3
Height of drawer in clear, in.	5th	4	4	5	7	7	8	8	14	5	11	9	
	4th	4	5	5	7	7	8	8	8	5	11		
	3rd	4	5	5	7	7	8	12	8	5	11	12	11
	2nd	5	5	8	9	10	8	5	8	5	15	12	11
	1st or bottom	15	13	10	9	10	9	5	10	11	5	12	11
Approximate total height from floor to bottom of top drawer, in.		71	71	71	77	77	76	73	77	69	63	73	53

Special arrangement of drawers at additional price.

Air Hoists

For hoists $3\frac{1}{4}$ to 6 in. in diameter, cylinders are seamless, drawn brass tubing, polished inside. Standard parts carried in stock. Hoists 7 to 24 in. are cast iron, carefully moulded and accurately bored and reamed. Valve is disk type of improved design. Stem does not pass through air chamber, eliminating leakage. Automatic cut-off.

Horizontal hoists for locations where headroom is insufficient for vertical hoists or where more easily supported.

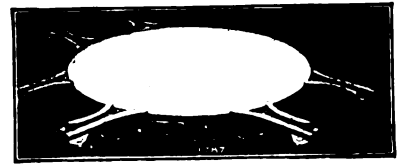
Turntables

Rigid, self-contained construction. No tipping, no getting out of line, no journal friction. Entire load carried on chilled rollers, held rigidly apart by spacing frame. Flat top standard.



AIR HOIST

Furnished also with track rail cast on top or with grooves for wheel flanges, to suit any gauge.



STANDARD TURNTABLE

Cars and Trucks

For severe service in foundry, shop or yard. Heavy steel frames. Full line of core oven cars and trucks, with and without shelves; chilled wheels, roller bearings.

STANDARD TRUCKS

No.	Capacity, tons	Gauge, in.	Platform		Diam. of wheels, in.
			Wide, ft. in.	Long, ft.	
2	2	18 to 24	3 0	4	16
3	3	18 to 24	3 0	4	16
5	5	18 to 24	3 0	4	18
12	2	24 to 30	3 6	5	16
13	3	24 to 30	3 6	5	16
14	5	24 to 30	3 6	5	18
140	10	30 to 36	4 6	6	20
141	10	36 to 42	6 0	8	20

Special sizes made to order.



STANDARD SHOP TRUCK

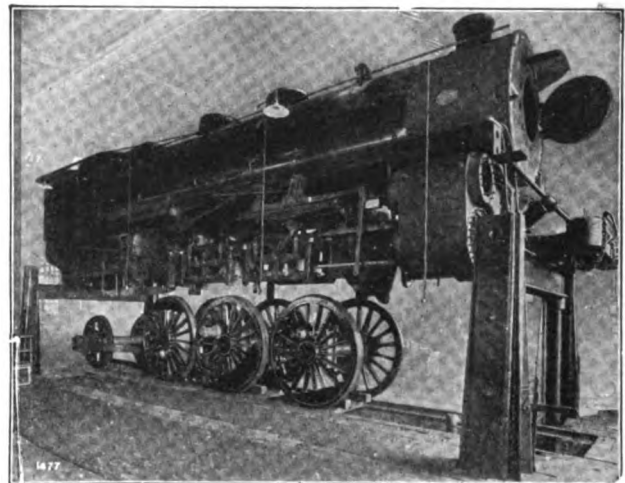
Elevators

For 1-story lifts only. Designed specially for foundry service in lifting charges to charging floor. Compressed air and hydro-pneumatic.

Railway Specialties

Locomotive Hoist—For unwheeling and wheeling locomotives of any type or size. Special six-jack design for handling Mallet compounds.

A recent test showed a saving of \$45.53 per locomotive as compared with a drop pit. All drivers can be removed at one time or only one pair, as desired. Wheels remain at floor level during all operations—absolutely safe. A big time and labor saver at division points and repair shops. Over eighty installations. Write for Railway Catalogue.



FOUR-JACK LOCOMOTIVE HOIST (Patented)

Coach Hoist—For removing trucks from passenger coaches and interurban street cars with speed and safety. Car or coach kept level while raising or lowering. Similar to locomotive hoist.

Transfer Tables—For locomotives or coaches. Designed for shallow pit. Practically any capacity, length or speed.

Turntable Tractor—New design of simple, rugged construction for turntables of any capacity and pit rail radius.

AIR REDUCTION SALES COMPANY

Manufacturers of Airco Oxygen, Acetylene, and Welding and Cutting Apparatus

HOME OFFICE

342 Madison Avenue

NEW YORK, N. Y.

DISTRICT OFFICES AND PLANTS

ATLANTA, GA.
BOSTON, MASS.
BROOKLYN, N. Y.
BUFFALO, N. Y.

CHICAGO, ILL.
CLEVELAND, OHIO
DETROIT, MICH.
EMERYVILLE, CAL.

JERSEY CITY, N. J.
MINNEAPOLIS, MINN.
OKLAHOMA CITY, OKLA.
PHILADELPHIA, PA.

PITTSBURGH, PA.
RICHMOND, VA.
ST. LOUIS, MO.
SEATTLE, WASH.

WAREHOUSES AND OTHER PLANTS AT INTERMEDIATE POINTS

Products

OXYGEN; ACETYLENE; WELDING and CUTTING APPARATUS and SUPPLIES; ACETYLENE GENERATORS.

Also Carbide, Nitrogen and Argon.

Airco Engineering Service

The AIR REDUCTION SALES COMPANY maintains a corps of oxy-acetylene welding and cutting specialists to assist in solving oxy-acetylene welding or cutting problems and in training welders in the art.

Airco Oxygen

Of a uniform high quality. It is shipped to users from Airco distributing stations located at important centers. There is an Airco distributing station conveniently near every Airco user. Each station is equipped with sufficient capacity, as to cylinders, to take care of the user's requirements on short notice. Airco Oxygen cylinders are of two sizes—containing approximately 110 cu. ft. and 220 cu. ft. of Airco Oxygen.

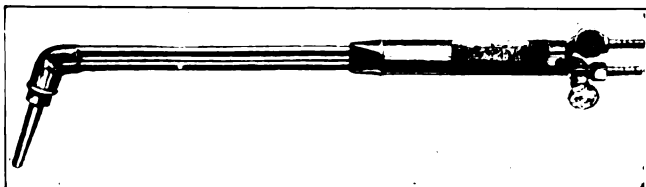
Airco Acetylene

Manufactured from calcium carbide at the Airco Acetylene plants located throughout the United States. Airco Acetylene cylinders are of a special design which insures maximum safety and fulfils all the requirements of the Interstate Commerce Commission and the various Safety Councils.

Airco Acetylene cylinder policy represents the greatest economy to the user. The same excellent methods prevail in the distribution of Airco Acetylene as for Airco Oxygen.



AN AIRCO PORTABLE OUTFIT



AIRCO "A" WELDING TORCH



TRADE-MARK

Airco "A" Welding Torch

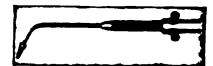
Designed for welding material from $\frac{1}{8}$ in. thick to the thickest metal practical to weld with the oxy-acetylene process. Furnished in lengths of 16, 20, 26 or 34 in., with 45°, 67½°, or 90° angle head, and 10 sizes of welding tips. The standard length, 20 in., weighs only 31 oz.

Airco "B" Welding Torch (Sheet Metal Torch)

Manufactured to meet the demand for a light, well balanced, substantially built torch for use in manufacturing plants where the same operation is done day in and day out and where the thickness of material does not exceed approximately $\frac{1}{4}$ in. The torch is furnished with 3 angles of head, namely: 45°, 75° and 90°; and weighs only 15 oz. It is furnished with 7 interchangeable tips designed for use in welding metal from $\frac{1}{8}$ in. to approximately $\frac{1}{4}$ in.

Airco "C" Welding Torch (Lead Welding Torch)

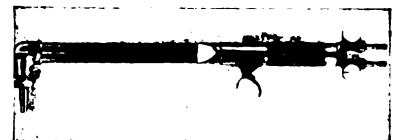
Manufactured to meet the demand for a torch with a hot, concentrated flame for delicate operations, such as very light sheet metal, dental and jewelry work. Furnished with 4 interchangeable tips for welding material from $\frac{1}{8}$ in. to approximately $\frac{1}{4}$ in. and weighs only 13 oz.



AIRCO "C" WELDING TORCH

Airco "D" Cutting Torch

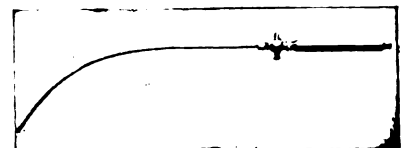
Designed along the same principles as Airco welding torches. Furnished with 3 types of head, namely: 67½° angle, 90° angle and straight; and with Airco standard cutting tips for steel, Airco cast iron cutting tips for cast iron, and Airco rivet cutting tips for rivet heads. Weights 3 lbs. without hose connections and tip.



AIRCO "D" CUTTING TORCH

Airco Carbon Burning Torch

Used for removing carbon from cylinders of internal combustion motors. Simply and strongly constructed and will more than pay for itself in a very short time, by the saving made over the usual costs of removing carbon from motor cylinders.



AIRCO CARBON BURNING TORCH

Airco Acetylene Generators

Manufactured in sizes ranging from a capacity of 25 cu. ft. of acetylene per hour to 300 cu. ft. per hour. Every effort has been made in the design and construction to make the generators foolproof by means of interlocking levers and other simple safety devices.

ESTABLISHED 1860

A. W. CADMAN MFG. CO.

Bearing Metals and Bearing Bronze

PITTSBURGH, PA.

Products

CADMAN PROCESS BEARING METAL; Acorn and Bearite Brands and Bearite Bearing Bronze.

Also, Cadman Indestructible Blow-off Valves and Cadman Gato Plug Valves for steam, air, water and acid resisting.

Cadman Process Bearing Metals

Since 1839, the year in which Isaac Babbitt patented his famous formula, tin, copper, antimony and lead have been the foundation of all standard babbitt metals. The only material improvement since that time has been the process of alloying these elements, by means of certain catalytic agents, invented by the late A. W. Cadman.

Lead and tin, the bases of all babbitt metals, are, in themselves, too soft for practical use. They must, therefore, be strengthened by the addition of some hardening agent. Antimony and copper are the ideal mediums for this purpose.

It is obvious that the more evenly this hardening material can be distributed throughout the base, the better will be the resultant metal. In fact, the desirable qualities of a babbitt can readily be shown to be in direct proportion to the extent to which its elements are alloyed.

Cadman metals are guaranteed to double the life of a bearing because they are perfectly alloyed.

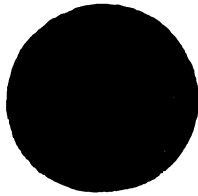
Acorn Brand Aluminum Babbitt

The microphotograph to the left below shows the typical structure of genuine babbitt magnified 100 diameters. The hardening agent, antimony, instead of being perfectly distributed throughout the tin-base, is scattered irregularly in the form of hard, brittle antimonial and antimonial-tin crystals.

The microphotograph to the right, also magnified 100 diameters, shows the structure of Acorn brand. The analysis of the two metals is identical, but the crystals have been entirely eliminated, proving the perfect alloying of the antimony with the tin.



GENUINE BABBITT



ACORN BRAND

The improvement in the physical properties is remarkable. Genuine babbitt has a tensile strength of 12,000 lbs. per sq. in.; Acorn brand, 15,000 lbs. per sq. in. Genuine babbitt has an elongation of 11%; Acorn brand, 22%.

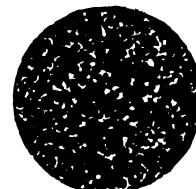
It is almost impossible to fracture Acorn brand by bending or pounding. It will wear to paper thinness before breaking. For more than 30 years Acorn brand has been standard the world over for severe service.

Bearite Metal

In certain types of bearing, particularly those which have a very thin lining and those which are subjected



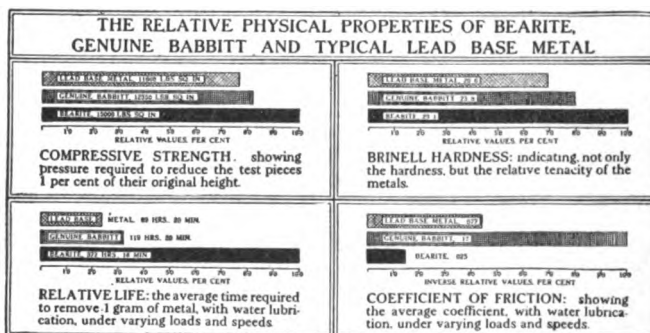
LEAD BASE METAL



BEARITE

to a heavy pound, a tin base metal such as Acorn is essential. In the great majority of machines, however, Cadman Bearite will fill the requirements as well—sometimes better—at considerably less cost. Impartial advice is always gladly given.

The perfect alloying of Bearite, possible only by the Cadman process, and indicated by the microphotographs above, has the most remarkable effect on its properties, as is graphically shown in the chart below.



The average life of Bearite is approximately 3 times that of metals made by usual methods, the conditions being equal.

Cadman metals can not score the shaft.

Bearite Bronze

Bearite bronze is unique in that it most nearly combines the valuable properties of a babbitt with the strength and high melting point of a bronze.

Bearite bronze is sufficiently plastic to readily conform to the shaft; yet it has a tensile strength of 20,000 lbs. per sq. in., and an elongation of 4% in 2 in.

Exhaustive tests run by one of the trunk line railroads showed this metal to have a rate of wear less than one-tenth that of phosphor bronze. The danger of cutting the shaft, even with neglected lubrication, is negligible.

Bearite bronze costs but a trifle more than ordinary bronze.

Applications

There is a Cadman metal for every purpose at almost every price. Full technical data will gladly be mailed on request.

THE AMERICAN BRASS COMPANY

Manufacturers of Brass, Bronze, Copper and Nickel Silver in all Forms of Sheets, Wire, Rods and Tubes

GENERAL OFFICES
WATERBURY, CONN.

MILLS AND FACTORIES

ANSONIA, CONN.

TORRINGTON, CONN.

BUFFALO, N. Y.

WATERBURY, CONN.

KENOSHA, WIS.

Products

BRASS, BRONZE, COPPER and NICKEL SILVER in every variety of SHEETS, ROLLS, PLATES, WIRE, RODS and TUBES.

Admiralty Condenser Tubes; Turbine Blading; Extruded Rods and Shapes; Hot Pressed or Forged Parts; Benedict Nickel White Metal; Tobin Bronze; Corrosion Resisting Brasses and Bronzes; Crucible Cast and Deoxidized Copper Tubes and Pipes.

Tobin Bronze, Phosphor Bronze and Gunmetal Alloys

For engineering installations, which require non-ferrous metals of uniform high tensile strength as well as resistance to corrosion, oxidation and wear, special bronzes can be supplied in the form of sheets, wire, rods and tubes.

These special alloys are successfully utilized in manufacturing coal screen plates, condenser tube plates, disk valves for pumps, diaphragms, plates and bolts for filtration plants, pump piston rods and plungers, valve stems, linings for hydraulic cylinders, welding and brazing stock, magneto parts, marine instruments and apparatus, etc.

Tobin bronze is a corrosion resisting alloy introduced many years ago by THE AMERICAN BRASS COMPANY. It is extensively used for yacht plates, fin keels, centerboards, rudders, pump cylinder linings, and for engineering construction in which the corrosive effect of salt water must be considered. Tobin bronze is supplied in sheets, plates, rods, tubes, etc.

Copper and Metals for Electrical Purposes

Anodes of the purest selected grades of copper, brass and bronze. Brush copper in rolls or flat strips of any desired temper and commercially free from imperfections. Hard drawn commutator copper of highest conductivity and durability in straight bars or in segments, sawed or punched to size.

Stranded copper transmission cable of high tensile strength and conductivity. Bare copper wire and cable. "K. K." weatherproof wire and slow burning wire.

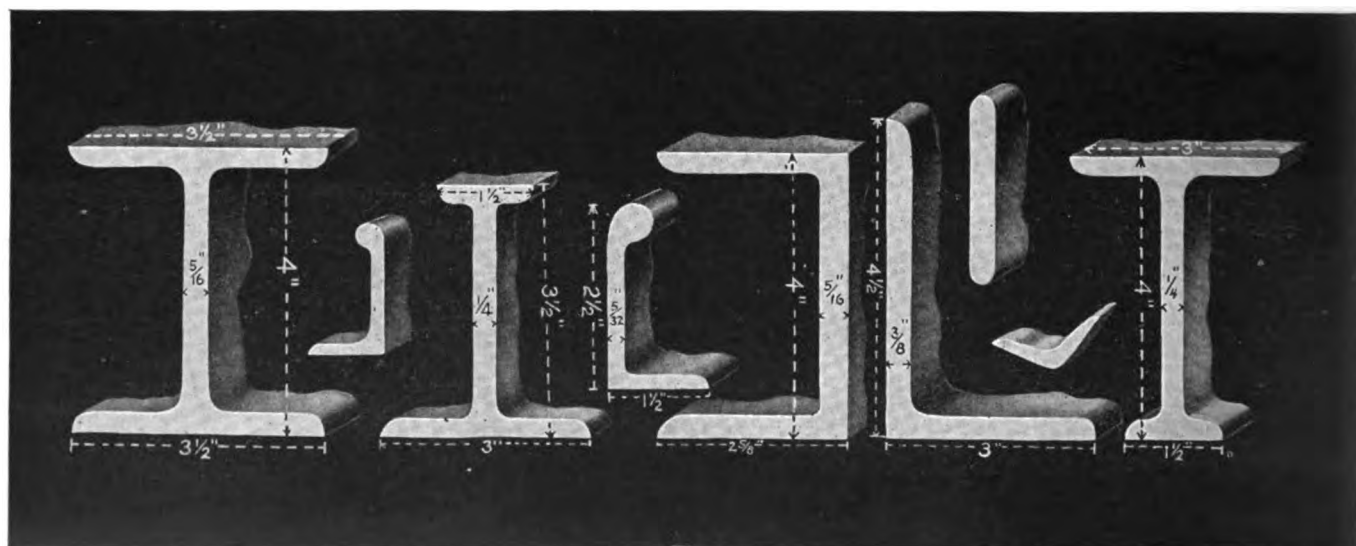
Nickel silver resistance wire.

Extruded Shapes for Engineering Purposes

In the extrusion process, a billet of semi-plastic metal is forced through a die of the desired cross section under hydraulic pressure. The resultant shape, which faithfully follows the engineer's sectional drawing, is of remarkable homogeneity and is free from the defects found in sand castings. Rods, bars, heavy angles, channels, tees and mouldings of various cross sections can be extruded from copper or copper alloys.

Extruded shapes are used in architectural construction, for railways and motor car trimmings and for manufacturing electrical goods, hardware, locks, etc.

The shapes are smooth, accurate and require little, if any, machining. Milled or sawed into short pieces, extruded shapes are widely used for the economical manufacture of small and intricate parts. Long lengths have proved exceedingly serviceable for ornamental and

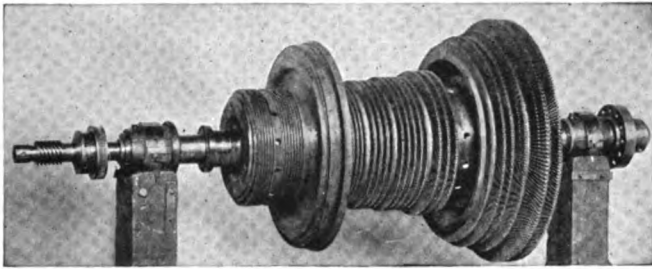


TYPICAL SECTIONS OF EXTRUDED METAL FOR ENGINEERING PURPOSES

structural purposes. The extrusion process improves the physical properties of the metal and extruded alloys of high tensile strength, such as naval brass, manganese bronze and nickel bronze, are particularly desirable for engineering purposes.

Turbine Blading

Turbine blades are made of various non-ferrous alloys to the specifications of steam turbine manufacturers. THE AMERICAN BRASS COMPANY has for many years supplied blades and packing strips to the leading turbine manufacturers of the country.



SPINDLE OF A WESTINGHOUSE-PARSONS TURBINE FITTED WITH BLADES OF SPECIAL ALLOY

Tubes

Tubes are made of brazed or seamless brass, bronze, copper, Benedict nickel in round, square and polygonal cross sections and in fancy patterns.

Condenser Tubes—THE AMERICAN BRASS COMPANY'S technical department has made a special study of condenser tube corrosion. Special equipment has been installed for the manufacture of condenser tubes by methods which insure a minimum of failure and a maximum of service.

Admiralty condenser tubes are especially recommended for both marine and stationary installations in which salt or polluted water is used. Anaconda con-

denser tubes are to be found in the installations of many ships and power houses. Seamless condenser tubes, guaranteed against splitting, are made of admiralty or Muntz metal alloys, tinned or untinned.

During the process of manufacturing, many tests are made to safeguard the interests of users of Anaconda condenser tubes, which include:

(1) The careful annealing of all tubes, scientifically controlled by the recording pyrometer and the careful checking by the photomicrograph of the grain size, both of which have an important influence on the ultimate life and performance of the tube.

(2) The hydraulic testing of each tube to 1000 lbs. per sq. in. internal pressure.

(3) The internal pneumatic testing of such tube under water of 500 lbs. per sq. in., which will immediately disclose any possible leakage or imperfection in the metal.

In addition to the above, all tubes are carefully inspected for inside and outside surface defects such as slivers, spills or seams, and where tubes are required to meet special physical conditions, each lot is subjected to standardized flattening, expanding and compression tests.

The failure of the tubes to stand the foregoing tests is sufficient cause for rejection. This assures 100% perfection in all tubes leaving the mills of THE AMERICAN BRASS COMPANY and a maximum possible life in service after being installed in the condenser. Let it be said that during the late war, less than $\frac{1}{10}$ of 1% of all tubes furnished the government by THE AMERICAN BRASS COMPANY were rejected for failure to withstand the foregoing tests.

Benedict Nickel Seamless Tubes—For plumbing where permanent white color is required.

Brass Pipe

Anaconda seamless, semiannealed brass pipe (iron pipe sizes) is supplied for hot and cold water service in plumbing systems. The pipe is made with the utmost technical care. It resists the corrosive effect of water that rapidly destroys ordinary pipe. For salt water, seamless pipe of admiralty mixture can be supplied. Anaconda seamless brass pipe is guaranteed against splitting.

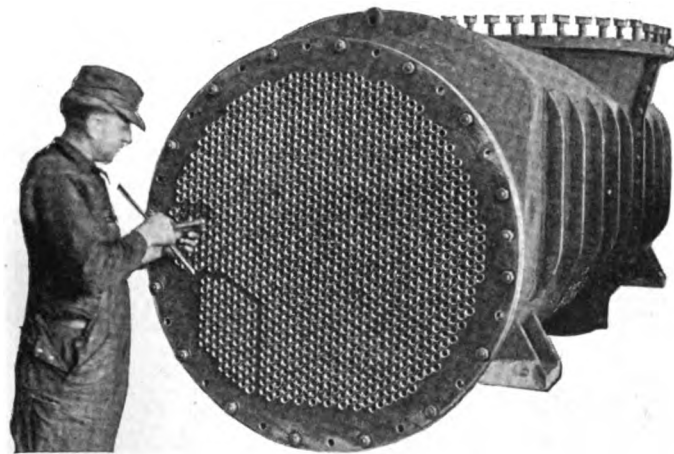
Services and Facilities

The mills of THE AMERICAN BRASS COMPANY, located as they are at Ansonia, Conn., Torrington, Conn., Waterbury, Conn., Buffalo, N. Y. and Kenosha, Wis., are able to make prompt deliveries to all important industrial sections of the country. These mills are equipped to manufacture non-ferrous materials for engineering purposes. The fullest requirements as to quality, finish, accuracy and dependability are met.

Technical Department

Special metallurgical problems receive the attention of an efficient technical department, the knowledge and experience of which are placed at the disposal of engineers.

Price lists and catalogues will be furnished on request.



CONDENSER MADE BY THE C. J. WHEELER COMPANY, PHILADELPHIA, PA.

In this condenser are 1184 Muntz metal tubes supplied by THE AMERICAN BRASS COMPANY

CHASE METAL WORKS

(DIVISION OF CHASE COMPANIES, INC.)

WATERBURY, CONN.

BRANCH OFFICES

NEW YORK, N. Y. BOSTON, MASS. PITTSBURGH, PA. ROCHESTER, N. Y. ATLANTA, GA.
PHILADELPHIA, PA. CHICAGO, ILL. CLEVELAND, OHIO LOS ANGELES, CAL.

SAN FRANCISCO, CAL., CHASE COMPANIES OF CALIFORNIA, INC.

Products

BRASS, BRONZE, COPPER, and NICKEL SILVER in the form of SHEETS, RODS, TUBES and WIRE.

Sheets, Rolls and Strips

Brass and bronze sheets, rolls and strips are furnished in various lengths, widths and thicknesses and in various qualities, anneals and tempers, including high, low, rich low, extra spring and best spring drawing, spinning and stamping brass, commercial bronze and gilding metal.

Nickel silver sheets and rolls furnished in 5% to 30% qualities.

Copper in rolls and strips furnished in a wide variety of sizes and thicknesses.

Circles, segments, pattern sheets, drawn strips and blanks furnished in brass, copper, bronze or nickel silver in any size or thickness desired.

Rods

High and low brass, commercial bronze, copper and nickel silver rods furnished in round, half round, hexagon, octagon, square, rectangular, oval, half oval and special shapes, in any size and length desired.

These rods have free cutting and drilling qualities, thus they are especially suitable for the many important products made in automatic screw machines or turret lathes.

Tubes

Brass, commercial bronze, copper and nickel silver



seamless and brazed tubes furnished in round, square, hexagon and special shapes in various diameters, lengths and wall thicknesses. Well known for their freedom from cracks or defects, their high tensile strength and their uniformity of quality, thickness and diameter. Carefully tested and inspected before shipment.

Condenser Tubes—We have special facilities for furnishing high grade seamless condenser tubes in all sizes, lengths and thicknesses in brass, admiralty mixture or muntz metal, either tinned or untinned. For use in stationary or marine condensers where salt or polluted water is used. Well known for their freedom from corrosion and splitting.

Brass Pipe

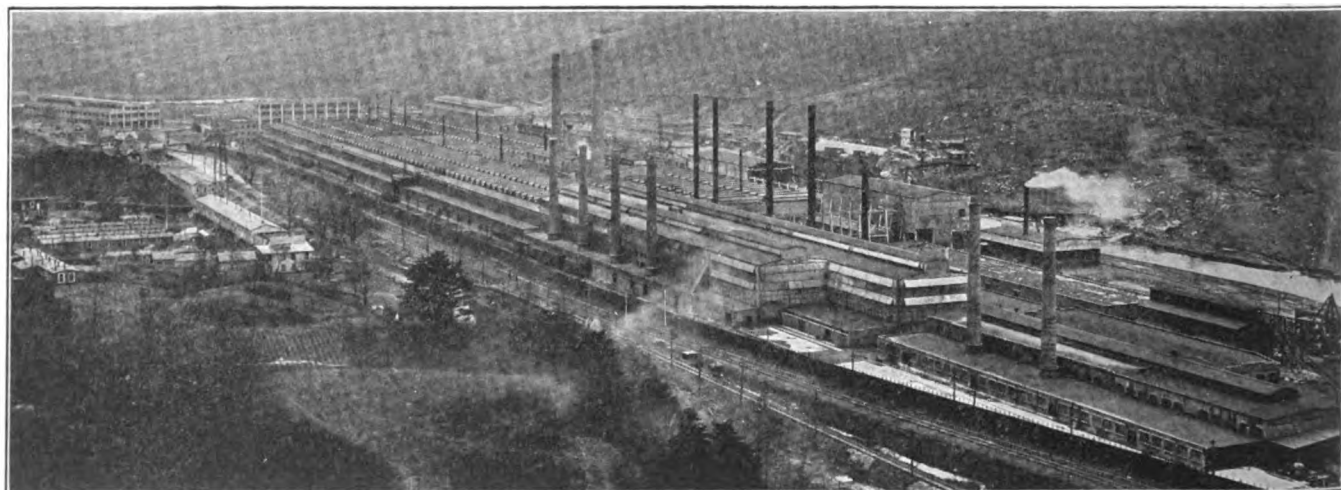
Seamless brass pipe is furnished in iron pipe and plumbers' sizes. Made of carefully selected metals and sufficiently annealed to prevent cracking. Will not rust or corrode and are free from cracks or other defects.

Uniform in diameter and thickness throughout. Carefully tested and inspected before shipment.

Wire

Brass and bronze wire is furnished in various qualities, anneals and tempers, including high and low brass, extra spring and best spring brazing brass, commercial bronze and gilding metal. Furnished in round, half round, hexagon, octagon, square, flat, and special shapes, either soft, hard or spring.

Nickel silver wire furnished in 5% to 30% qualities in the same shapes as brass wire.



PLANT OF THE CHASE METAL WORKS

AUTOMATIC WEIGHING MACHINE CO.

50 Church Street
NEW YORK, N. Y.

LONDON, ENG., WILLIAMS & PELL, Gray's Inn Road, 4 Regent Square

Products

AUTOMATIC WEIGHING MACHINERY for Weighing, Packing, Sealing and Conveying raw and manufactured products.

United States Distributors for the Blake-Denison Automatic Weighing and Recording Machine.

"Automatic" Scales

These simple, speedy, durable and accurate scales have proved necessary factors for economical production and are being used by the leading manufacturers in the United States.

They are made in various standard models and sizes for everyday weighing and packing needs, only a few of which are illustrated below. Consult this company's engineers for particulars.

All machines guaranteed.

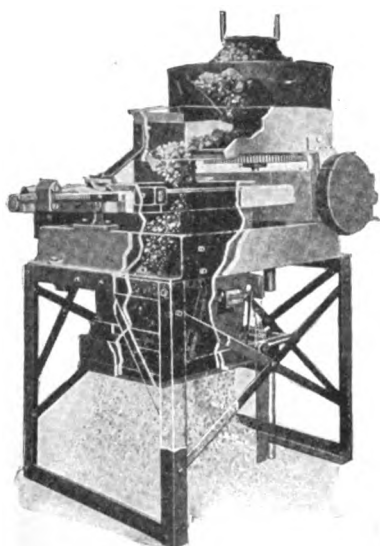
Wide Range of Adaptability—"Automatic" scales are adapted to the use of manufacturers and packers of:

Coal	Washing Powder	Fertilizers	Limestone
Sugar	Cereals	Cottonseed	Rock dust
Coffee	Rice	Cottonseed meal	Clinker
Spices	Wheat	Powders	Gypsum
Flour	Rolled Oats	Tobacco	Tacks
Starch	Salt	Cement	Nails
Seeds	Drugs	Clay	Malt, etc.

Carton Sealing Machines

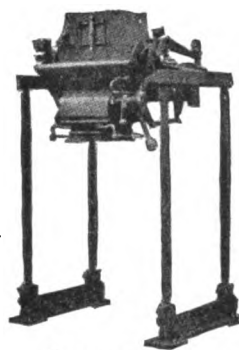
This company offers carton gluing and sealing machines which are unequalled for combined qualities of speed, accuracy, simplicity, durability and low cost of maintenance.

Salient features are: most economical disposition of floor space; entire absence of air and steam lines; shortest time consumption when changing from one size carton to another; entire absence of rapidly moving parts; absence of spoiled cartons; all flaps folded when carton is stationary; operation entirely automatic.



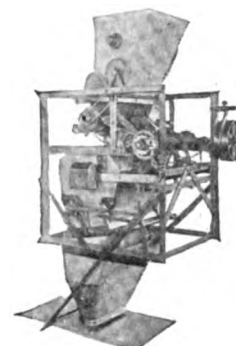
COAL SCALE

Furnished complete with motor. 200-lb. capacity per discharge. 1 to 6 discharges per min. Guaranteed to operate within $\frac{1}{2}$ of 1%



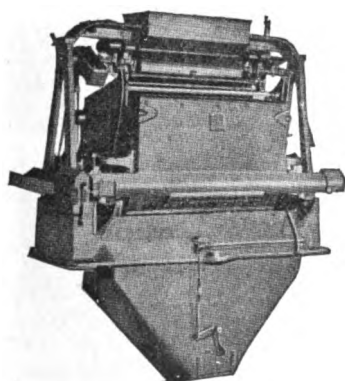
BAGGING SCALE

Gravity feed. Capacity, 50 to 200 lbs., 5 to 6 sacks per min. Can be supported from floor, either stationary or portable or suspended from overhead, either bin or trolley



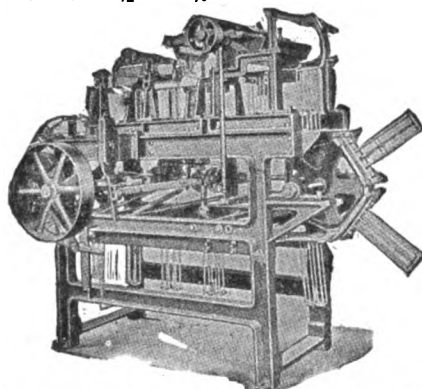
POWDER AND COM-
POUND SCALE

For weighing powdered and granular materials where a varying and wide range of weights is desired. Capacity, 1 to 60 lbs.; 3 weighings or more per min. Heavy preliminary and light final feeding mechanisms. Hand or automatic discharge or at timed intervals



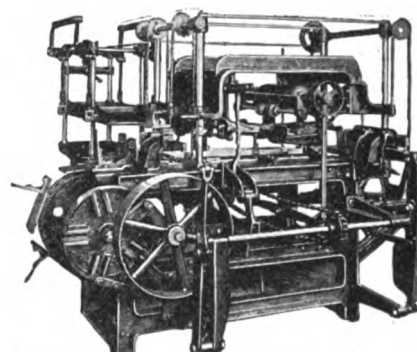
MILL AND ELEVATOR SCALE

For grains and free flowing materials. Gravity feed. Various sizes and models; 4 to 10 weighings per min. Can be supported from overhead track or from floor. Automatic or hand tripped



Machine for Automatically Sealing Bottom End of Cartons

Speed, 25 to 35 cartons per min. Requires $\frac{1}{2}$ h.p. and 100 x 45 in. of floor space. One operator required



Machine for Automatically Sealing Top Ends of Cartons

Speed, 25 to 35 cartons per min. Requires $\frac{1}{2}$ h.p. and 84 x 68 in. of floor space. No operator required

CARTON SEALING MACHINES

Complete outfit consists of bottom sealer, scale and top sealer, connected with a suitable conveyor, handling all one size carton, or various sizes of cartons

MERRICK SCALE MFG. CO.

Designers of Weighing and Conveying Installations

CABLE ADDRESS
"WEIGHTOM, PASSAIC, N. J."

178 Autumn Street
PASSAIC, N. J.

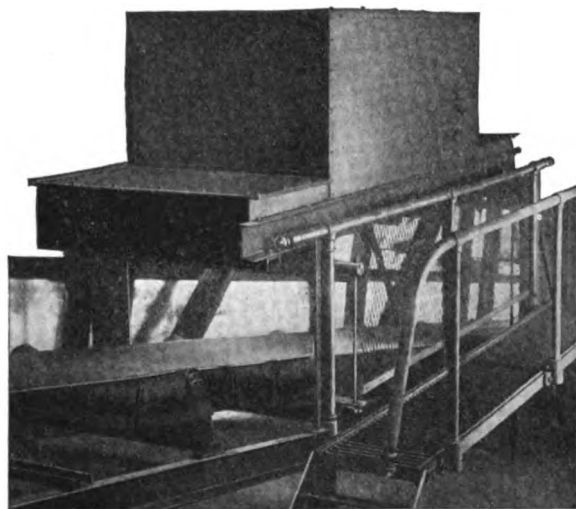
CODES
ABC, Western Union,
Bentley

Product

The MERRICK WEIGHTOMETER.

Description of the Merrick Weightometer

The Weightometer consists of a pair of weighing levers, and a steelyard or beam, similar to that of the platform scale, but of special design, so that a short section of the conveyor can be suspended from the weighing levers. The load on this suspended portion, however distributed, is always automatically counterbalanced by the buoyancy of a cylindrical iron float immersed in a mercury bath and suspended from the long end of the weighing beam. This float allows the beam to move



INSTALLATION OF MERRICK WEIGHTOMETER

from its position, when the conveyor is empty, in exact proportion to the weight of material on the suspended portion of the conveyor at any moment. A mechanical integrator totalizes the movement of the beam, with a factor obtained from the travel of the conveyor by means of suitable gearing from the bend pulley or sprocket wheel. The result obtained from the product of two quantities, one proportional to the weight of the material suspended and the other to the travel, therefore represents accurately the total weight of material moved. This is plainly indicated, by a register, in units and decimals of either a short ton, long ton, metric ton or other desired units.

Applications

Weightometers have been installed by hundreds of concerns in the United States and in the majority of foreign countries of the world. Materials weighed in domestic and foreign service include:

Coal	Coke	Stone	Gravel	Sand
Caliche	Copra	Hog fuel	Wood chips	Limestone
Ammonium sulphate	Sulphate pulp	laps	Sugar beet cossettes	
Slaughter house tankage			Fish or fish products	
Asbestos rock			Phosphate rock or pebbles	

Cement rock, clinker and finished cement, iron, silver, gold, zinc, lead, copper and telluride ores and metallic ore concentrates.

Guarantee

This company guarantees to replace by new ones, free of charge, f. o. b. factory, Passaic, N. J., any parts breaking or wearing out from ordinary use within one year's time, providing the defective part or parts be returned with transportation prepaid within a reasonable time after receipt of new part.

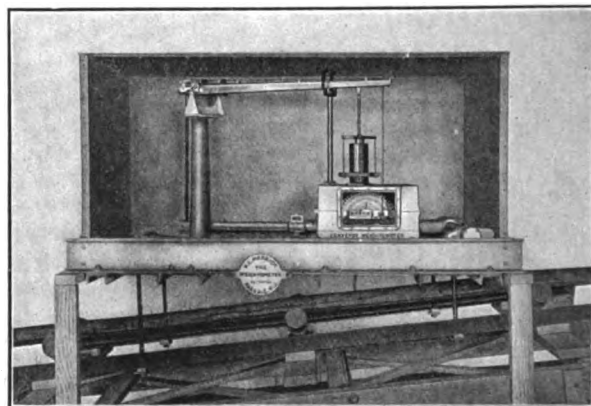
Accuracy

This company guarantees, when this machine is erected and operated in accordance with instructions, that the accuracy shall be within 99% of the actual weight of material carried over the conveyor at a rate of not less than one-half of the maximum capacity for which the Weightometer is designed. This is not limited to a uniform continuous load, as portions of the conveyor may be loaded to full capacity of the Weightometer with empty portions intervening.

In testing, at least sufficient material must pass over the conveyor to register 5 or more unit figures on the counter.

Registration

Weight to be registered by 5-figure counter in tons of 2000 lbs. and decimals thereof, unless otherwise requested. Registration can be made in other units, as long tons, metric tons, barrels of a certain number of pounds, etc.



VIEW OF WEIGHTOMETER ON BELT CONVEYOR
Front sheet of casing removed

Essential Features

The important advantages of the Merrick Weightometer are:

Easy installation; automatic operation; no expense for attendance; durability; simplicity; sheet iron enclosure for all working parts, thereby eliminating exposure to dust and interference by tampering; weighing without interruption of conveyor service, and a high degree of accuracy, whether the load be intermittent or uniform.

RICHARDSON SCALE COMPANY

Manufacturers of Automatic Weighing Machinery

PASSAIC, N. J.

BRANCH OFFICES

ATLANTA, GA.
BOSTON, MASS.

BUFFALO, N. Y.
CHICAGO, ILL.

MEMPHIS, TENN.
MINNEAPOLIS, MINN.

NEW YORK, N. Y.
OMAHA, NEBR.

SAN FRANCISCO, CAL.
WICHITA, KAN.

Products

RICHARDSON AUTOMATIC SCALES.
BARTLEY PORTABLE SAWMILLS.

Richardson Automatic Scales for Bulk Weighing and Sacking

Standard types of Richardson automatic scales are furnished for special requirements in weighing the following materials:

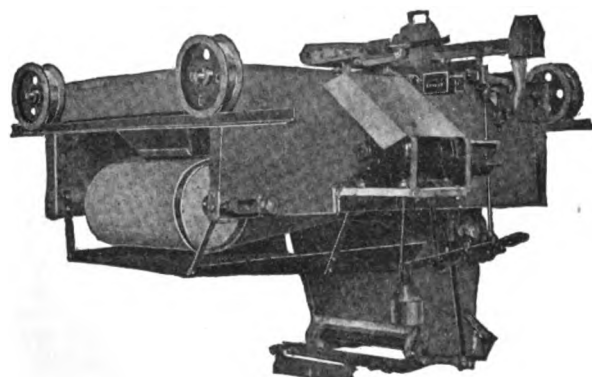
Grain and grain products	Coal as delivered from over-
Ground and mixed feeds	head bunkers to stokers
Refined and raw sugar	Cement, crushed stone, sand,
Sugar beet pulp and	gravel, phosphate, gypsum,
sugar juice	clinker, glass sand, shale,
Cottonseed and its by-products	clay and other granular and
Cleaned and rough rice	lumpy materials

Cutting Costs with the Richardson Automatic Scale

Richardson automatic scales are known and used in all parts of the world. They are universally acknowledged to be uniformly accurate and dependable machines for registering weight. In many industries, continuous day and night records of raw materials, materials in process of manufacture and finished products are essential, and to furnish such records *accurately* and at *lowest cost* is the function of a Richardson automatic scale.

Each type of machine is designed to simplify a specific weighing problem, and in every instance where a Richardson automatic scale can be used, it is a practical economy to use it. Easy and inexpensive to install, a Richardson operates automatically and is weight registering.

A Richardson automatic sacking scale always saves the labor of a weighman. Thousands of these machines are used for sacking corn, wheat, oats and all kinds of dry, free running grains and feeds. One man operating a Richardson automatic grain sacking scale can do as much work in an hour as 2 or 3 men weighing by hand on a platform scale.



RICHARDSON AUTOMATIC COAL SCALE

Richardson Automatic Coal Scale

Registers automatically exact weight of coal delivered from overhead bunkers to stokers. *Weighs any kind of coal*—wet, lumpy or frozen—without choking or starving fires, the feed being automatically regulated by the requirements of the stokers.

Immune to temperature changes in the boiler room. Absolutely sulphurproof and rustproof.

Illustrated catalogue and list of users furnished on request.

Richardson Automatic Bulk Scale

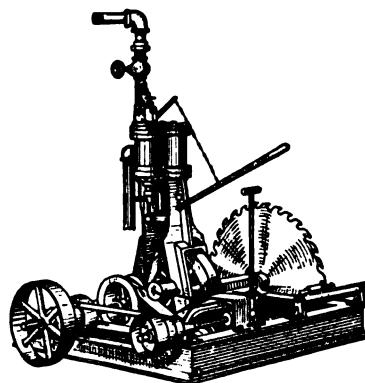
Very similar in type to the standard automatic coal scale illustrated. A thoroughly tested machine. Measures accurately the weight of lumpy, granular materials as listed in second column above. *Absolutely choke-proof*, immune to temperature changes and entirely rust-proof. Accurate and continuous records available for day and night work.

A small length, wide, slow-speed conveyor belt (part of machine) feeds material to scale hopper in a steady stream. Scale weighs in pre-determined drafts, and discharges and registers automatically.

Bartley Direct Connected Portable Sawmill

This sawmill has been on the market for over 30 years. No type of portable mill has ever been put to severer tests. Used all over the world for cutting hard and soft wood under the most difficult conditions. Users willingly testify to its superiority over all other types. Never fails to stand up under heavy service. Produces more feet of lumber per dollar of investment than any other mill made.

The Bartley direct connected steam driven mill is a self-contained unit. Engine is directly attached to saw mandril and power is directly applied to saw. All belt troubles eliminated and mill cuts up to capacity in coldest weather. No expense for fuel. Scrap wood generates steam. Most powerful and economical sawmill made. Furnished with or without boiler.



BARTLEY PORTABLE SAWMILL

RELIANCE WEIGHING MACHINE DIVISION

STEARNS MOTOR MFG. COMPANY

GENERAL OFFICES AND FACTORY
LUDINGTON, MICH.

REPRESENTATIVES IN PRINCIPAL CITIES OF THE UNITED STATES AND CANADA

Products

RELIANCE AUTOMATIC COAL SCALES.

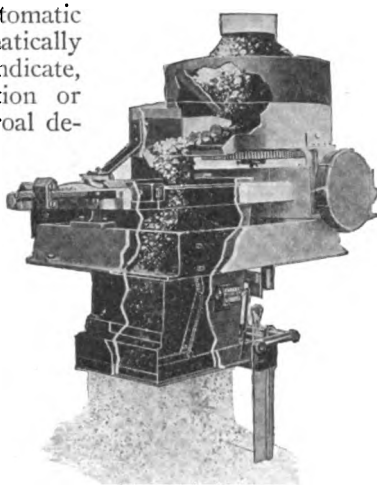
RELIANCE GRAVITY TYPE AUTOMATIC SCALES designed for free-flowing bulk materials such as corn, wheat, oats, rice, dry chemicals, sand, lime, gravel, etc.

RELIANCE SACKING AUTOMATIC SCALES.

RELIANCE APPORTIONING AUTOMATIC SCALES.

Reliance Automatic Coal Scales

The Reliance automatic coal scale will automatically weigh, record and indicate, without human attention or manual effort, all the coal delivered and consumed, with a mathematical precision that manual weighing can not approach. Its installation in existing plants or new construction can be effected with ease and economy. To meet peculiar, local conditions, the Reliance automatic coal scale can be varied by making the installation either suspended or supported, portable or semiportable, or fixed.



SECTIONAL VIEW OF RELIANCE AUTOMATIC COAL SCALE SHOWING OPERATION

Sturdy Construction—A heavy, cast iron frame constitutes the base from which all other parts are supported. This design obviates possibility of distortion and consequent inaccurate operation of the weighing elements.

The weigh beam is of heavy construction and of the four-to-one ratio, thereby reducing the amount of counterweight necessary to balance the weigh hopper and weighing parts, and very materially reducing the stress on the wearing surfaces.

The knife edges on which the weigh beam and weigh hopper are balanced are of hardened steel and completely housed in dustproof, cast iron boxes. The parts which control the accuracy of the weighment are rendered dustproof by special design of self-shedding section.

The units in the power box are carried on eleven New Departure ball and ball thrust bearings driven by an electric motor of standard manufacture. Driving gear and motor pinion are cut cast iron spur gears fully enclosed. Miter gears are cut steel. Disc driving pinions are cut cast iron spur gears. Operating shaft is amply provided with oilers insuring proper lubrication.

All parts of the Reliance automatic coal scale which come in contact with the coal are of gray cast iron, to avoid corrosion resulting from the action of coal.

Operation—The coal which is to be weighed passes through the weighing machine to the hoppers or

stokers and the total amount is indicated by an improved recording device which can be attached directly to the machine or placed at a remote point (on a central gage board if desired).

Capacity—The maximum capacity of the Reliance automatic coal scale is 30 to 36 tons per hour. Its operation is entirely governed by the supply and consumption. As fast as the coal is removed from the discharge gate the scale functions.

Economies Effected by Weighing Coal—The accurate weighing of coal by the Reliance automatic coal scales is a positive check on the total amount of coal purchased. The scales also show exactly how much coal is being consumed by each boiler and furnace. It is thus possible to determine which of the heating units is least efficient and also the relative efficiencies of various grades of coal from different mines. This makes it possible to effect a considerable saving in the amount of coal burned.

Reliance Gravity Type Automatic Scales

Built in sizes to handle from 1 to 10,000 bushels per hour.

Designed especially for the handling of free-flowing bulk materials, such as corn, wheat, oats, rice, dry chemicals, sand, gravel, lime, etc. Due to the specially designed reserve hopper, it is possible to weigh this class of material with an accuracy of $\frac{1}{8}$ of 1% continuously and automatically.

Reliance Sacking Automatic Scales

Manufactured in two types: Power driven for non-free-flowing materials, and gravity for free-flowing materials. The power driven machine is the same as the automatic coal scale, with the sacking attachment. Built in sizes suitable for the various sizes of sacks, bags or barrels, depending on the nature of the commodity and the required weight per unit.

Reliance Apportioning Automatic Scales

These machines are designed especially for plants where the manufacturing process involves the correct apportioning of various ingredients.

Made up in batteries of any desired number with any combination of sizes capable of weighing from 1 to 300 lbs. each, so arranged that the entire battery is discharged on the completion of the largest weighment.

Accurate Testing

All Reliance automatic scales are subjected to severe, rigid tests and are accurately adjusted before shipment.

Co-operative Engineering Service

This company is prepared, and will be glad to co-operate with plant operators and engineers in the solution of difficult problems affecting the measuring, apportioning, weighing and recording of amounts of coal, gravel, cereal grains, cement, clinker, charcoal, salt, etc.

SCHAFFER ENGINEERING & EQUIPMENT COMPANY

Weighing and Compounding Machines

GENERAL OFFICES
2828 Smallman Street
PITTSBURGH, PA.

Products and Services

POIDOMETER, for Weighing and Compounding materials.

CONTINUOUS LIME HYDRATOR.

INDUSTRIAL ENGINEERS, specializing in the Non-METALLIC MINERAL INDUSTRIES. Calcining Systems, Hydrating Systems.

The Poidometer

For use where materials up to 4-in. cubes are required to be weighed or compounded with absolute accuracy.

It is a self-contained unit, foolproof, built for heavy service, and yet so nicely balanced that it responds to the weight of a silver dollar.

In the ordinary installation the Poidometer hopper encloses the opening in the material bin. Where a continuous and uniform flow of material is required, the tonnage (or fraction) per hour is reduced to pounds per running foot of belt, to which the calibrations on the scale beam correspond.

Thus, if the weight on the scale beam is set at 15 lbs., it will require exactly this weight per foot of belt to balance the beam, and if the speed of the belt is regulated to say, 40 f.p.m., the Poidometer will deliver 10 lbs. per second, 600 lbs. per minute, or 18 tons per hour, with a guaranteed accuracy of not less than 99½%.

A variation in the tonnage is possible by shifting the scale beam weight, which can be locked in place if desired.

The Poidometer will automatically refuse to operate unless it receives the weight of material called for on the scale beam.

The material is prevented from clogging or bridging by an agitator in the Poidometer hopper, which makes a half revolution and reverses itself.

A Productometer attachment records the feet of belt travel, and thus the weight of the material handled in a given time.

Our Weighmaster attachment converts the Poidometer into a batch weigher.

Liquidometer Attachment—This adjunct to the Poidometer delivers liquids in proportion to solids, or the process can be reversed so that solids will be delivered in proportion to liquids.

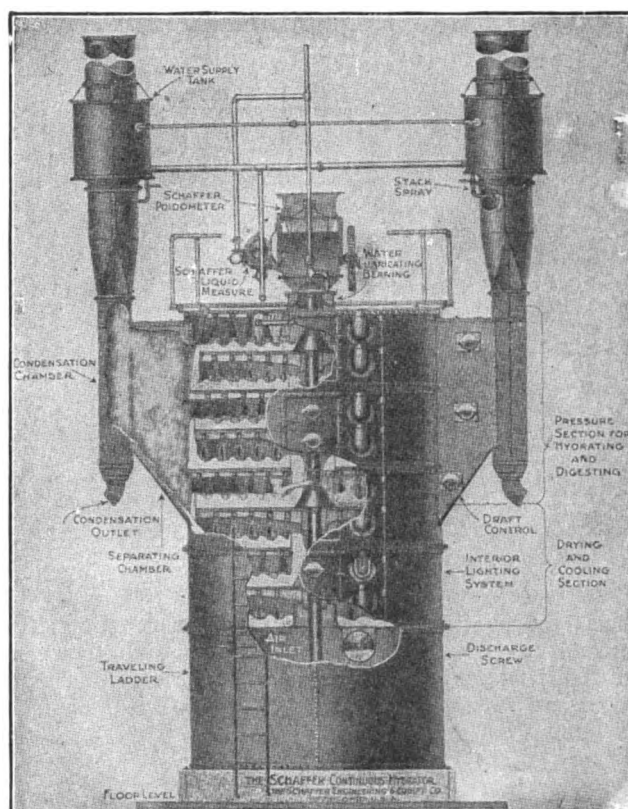
Poidometers are equipped with automatic controls as standard equipment.

There is nothing about the Poidometer to get out of order, and users report that machines in use for ten years have cost not one cent for repairs.

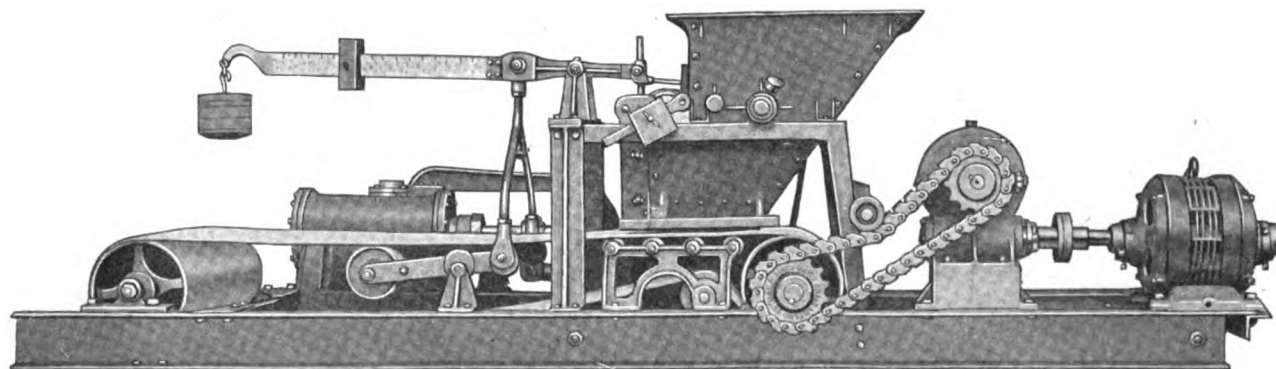
Let us solve your weighing, compounding or tempering problems.

Schaffer Continuous Lime Hydrator

This machine produces the highest grade hydrate obtainable. Capacities ranging from 2 to 20 tons an hour, per unit. Leading lime manufacturers use this equipment. Names on request.



SCHAFFER CONTINUOUS LIME HYDRATOR



THE POIDOMETER

LAKEWOOD ENGINEERING COMPANY

Narrow Gauge Gasoline Locomotives

CLEVELAND, OHIO

For District Offices, see page 41

Products

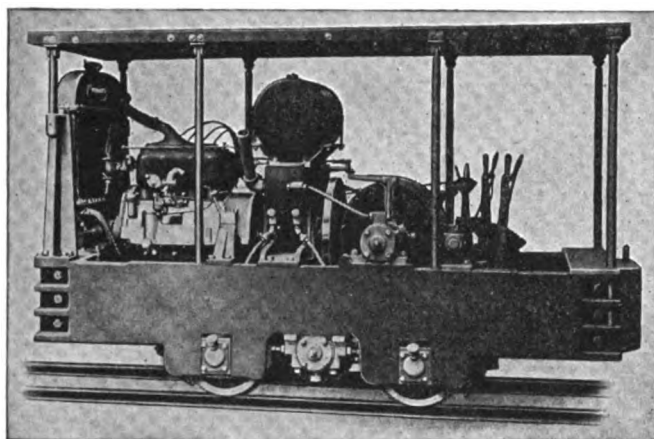
LOCOMOTIVES for Gasoline or Kerosene.

For Clamshell Buckets, see page 41; for Industrial Railway Equipment, see page 896; for Industrial Tractors and Trucks, see page 899.

Application

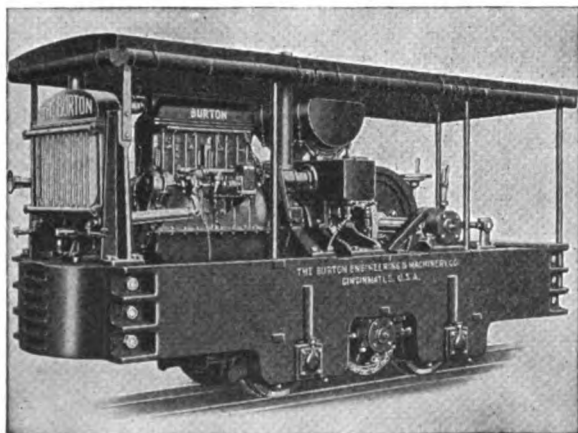
For narrow gauge railway haulage in every industry, in highway and general building construction, quarries, plantations, logging, brick and clay plants, sand and gravel pits, and all industrial plants.

The Burton locomotive combines simplicity of construction, flexibility of operation, and economical performance. Briefly, it consists of a power plant mounted on a rigid cast frame, carried on four flanged wheels set to a short wheel base. Power is transmitted to track



BURTON 3 1/2-TON LOCOMOTIVE

wheels by friction disc and roller chains, eliminating spur and bevelled gears, friction clutches, and other complicated parts. Operates in either direction at equal speeds and with equal efficiency. Speeds 2 1/2 to 10 miles per hour.



BURTON 6-TON LOCOMOTIVE

Other features are: magneto ignition, radiator cooling system, fuel tanks of ample capacity, sand box, link and pin couplers adjustable to various heights.

Brakes applied to all four wheels, controlled by lever, lock wheels instantly in case of emergency.

Winding drum is furnished, when desired.

Specifications

Burton 3 1/2-ton Locomotive—

Size of motor—3 1/2x5, 4-cylinder.
Horsepower—23 at 1200 r.p.m.
Magneto—Bosch high tension.
Carburetor—Gasoline or kerosene.
Generator—6-volt.
Starting motor—6-volt.
Battery—Lead plate.
Steel wheels—18-in. diam. x 4-in. face x 2 7/8-in. bore.
Sprockets—14T and 34T, 3/4-in. radius, 1 1/4-in. pitch.
Chain—3/4-in. roller, 1 1/4-in. pitch.
Axle bearings—Hyatt heavy duty.
Jack and friction shaft bearings—Hyatt heavy duty.
Transmission bearings—Timken thrust.
Radiator—16-gal. capacity.
Axle diameter—3 1/4 in.
Jack shaft diameter—3 1/4 in.
Friction shaft diameter—3 1/4 in.
Diameter friction disc plates—23 in.
Diameter tarred fiber filler—22 in.
Wheel base—39 in.
Draw bar pull at 5 miles per hour—1400 lbs.
Fuel tank capacity—20 gals.

OVER-ALL DIMENSIONS. 3 1/2-TON LOCOMOTIVES

Gauge, in.	Width, ft.-in.	Length, ft.-in.	Height, ft.-in.
18 and 24	4 0	10 5	6 2
30	4 7	10 5	6 2
36 and 42	5 7	10 5	6 2
4 ft. 8 1/4 in.	5 4	10 5	6 2

Burton 6-ton Locomotive—

Size of motor—4 1/2x6, 4-cylinder.
Horsepower—52 at 1200 r.p.m.
Magneto—Bosch high tension.
Carburetor—Gasoline or kerosene.
Generator—6-volt.
Starting motor—6-volt.
Battery—Lead plate.
Steel wheels—18-in. diam. x 4-in. face x 3 1/4-in. bore.
Sprockets—12T, 22T and 33T, 1-in. radius, 1 3/4-in. pitch.
Chain—1-in. roller, 1 3/4-in. pitch.
Axle bearings—Hyatt heavy duty.
Jack and friction shaft bearings—Hyatt heavy duty.
Transmission bearings—Timken thrust.
Radiator—20-gal. capacity.
Axle diameter—3 1/2 in.
Jack shaft diameter, 3 1/2 in.
Friction shaft diameter—3 3/4 in.
Diameter friction disc plates—30 in.
Diameter tarred fiber filler—28 1/2 in.
Wheel base—48 1/2 in.
Draw bar pull at 5 miles per hour—2400 lbs.
Fuel tank capacity—20 gals.

OVER-ALL DIMENSIONS. 6-TON LOCOMOTIVES

Gauge, in.	Width, ft.-in.	Length, ft.-in.	Height, ft.-in.
18 and 24	4 7 1/2	12 5 1/2	6 3 1/2
30	4 7 1/2	12 5 1/2	6 3 1/2
36 and 42	5 7 1/2	12 5 1/2	6 3 1/2
4 ft. 8 1/2 in.	5 4	12 5 1/2	6 3 1/2

C. W. HUNT COMPANY, INC.

Manufacturers of Industrial Railways and Coal Handling Machinery

GENERAL OFFICE AND WORKS
WEST NEW BRIGHTON, N. Y.

NEW YORK OFFICE: 143 Liberty Street
REPRESENTATIVES

BOSTON, MASS., ERNEST F. LEARNED, 141 Milk Street

CHICAGO, ILL., PHILLIPS, LANG & COMPANY, INC., 538 South Dearborn Street

Products

INDUSTRIAL RAILWAY TRACKS; SWITCHES; MOTOR OPERATED and PUSH CARS; SCALES; ELECTRIC MINE and INDUSTRIAL LOCOMOTIVES; CABLE RAILWAYS; AUTOMATIC RAILWAYS; CONVEYORS; COAL CRACKERS; SKIP HOISTS; BIN and HOPPER GATES; WEIGHING LARRIES; COAL TUBS; "STEVEDORE" MANILA TRANSMISSION and HOISTING ROPE; DRILLING CABLE; TRANSMISSION ROPE COUPLINGS.

Co-operative Service

Since every coal handling or railway proposition has specific requirements and conditions to meet, our engineering staff is at the disposal of all parties interested in the above classes of work. It will gladly advise, recommend, or furnish estimates.

Facilities

Standard parts most in demand are carried in stock. The company's resources, including plant, capital and engineering force, are prepared for prompt action on the largest special requirements. Prompt deliveries are further assured through exceptional shipping facilities—Baltimore & Ohio R. R. tracks on the property and wharf accommodating the lighters of every railroad centering in New York City.

Industrial Railway and Equipment

Tracks—Made up—Made in sections 20 ft. long of standard light rails riveted to cupped or flat steel ties. Ties are spaced 24½-in. centers and 7½ in. from ends. Special lengths to order.



FIG. 1. CAST PLATE STRAIGHT TRACK
Sectional view

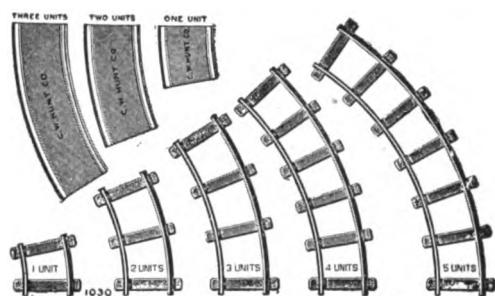


FIG. 2. ROLLED STEEL AND CAST PLATE CURVES



FIG. 3. LEFT-HAND SWITCH, WITH STAND



FIG. 4. TWO-WAY SWITCH



FIG. 5. RIGHT-HAND SWITCH



TRADE-MARK

Knocked Down—Made in sections 15 ft. long of standard light rails, bolted up in field to special cross ties with clips and bolts. Special lengths to order.

Cast Plate—Track cast integral with plates and made in standard lengths up to 5 ft. (Fig. 1).

Curves—Hunt short radius curves are made with a special guard rail which in conjunction with Hunt special running gears eliminate friction when cars are rounding sharp curves (Figs. 2, 9 and 10).

Switches—Left-hand, right-hand, 2-way or 3-way, with or without stands. Also can be furnished in cast plate (Figs. 3, 4 and 5). Frogs, crossovers and turntables are also manufactured.

Any workman of ordinary intelligence can put together a whole system ready for use.



No. 011
Standard Eight-wheel Shop Car



No. 0355
Standard Charging Car



No. 07129
Standard Four-wheel Self-dumping Push Car



No. 014
Standard Tip Car



No. 0594
Standard Shop Car



No. 0491
Standard Foundry Car

FIG. 6. INDUSTRIAL RAILWAY CARS

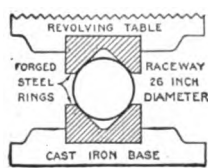


FIG. 7. TURNTABLE WITH SKETCH SHOWING CONSTRUCTION OF BALL BEARING



FIG. 8
ROLLER BEARING

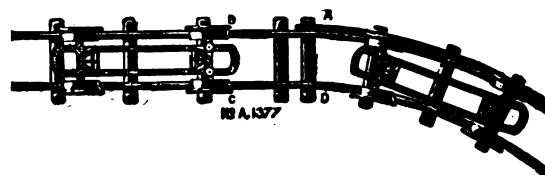


FIG. 9. POSITION OF TRUCK AXLES WHEN ROUNDING A CURVE

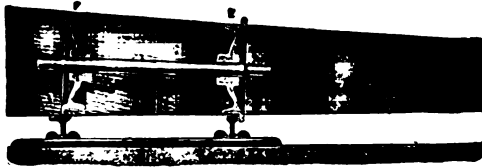


FIG. 10. THEORETICAL CONE AND CIRCULAR PATH BY AXLE AND WHEELS IN ROUNDING A CURVE

Cars—Bodies of various designs to meet a wide range of use, but all have essentially same truck construction. Axle bearings are either plain or roller bearing. Arrangement of running gear (Fig. 9) facilitates propulsion on short curves. Standard width for clearance of cars is 4 ft. Curve radius, 12 ft.

Track Scales—Made in both iron and wooden frames, especially designed for use with industrial railway, track ends connecting directly with either cast plate track or made-up steel track of railway system.

Both types of scales are provided with a tare beam to balance weight of empty cars so that load beam will give net weight of load. Beams are furnished graduated to pounds or kilograms as desired.

Cast iron type has track rails cast integral with both platform and frame. Platform is 27 in. wide, and clearance distance from center of platform to beam box, when beam is parallel with car track, is 44 in. Where necessary, an extension to base can be fitted to frame, moving beam 4 ft. further or a lesser distance away. Beam box is cast iron and can be made to face in any direction to secure best light on beam. Weights are attached to beam to prevent their being misplaced or lost.

Electric Locomotives for Industrial and Mine Service—Narrow gage electric locomotives in connection with industrial railways further reduce cost of handling material. Designed to take full load around 12-ft. radius curves as easily as on straight track. Various types of locomotives are made to pull loads up to 50 tons.

Standard machine as shown (Fig. 11) is built for any track gage from 18 to 36 in. Minimum curve radius 10 ft. Rated draw bar pull is 800 lbs., at 4 miles per hour; steel wheels slip at 1600 lbs. starting pull.

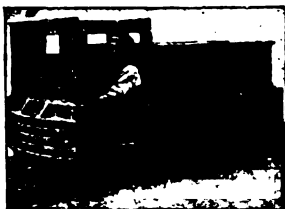


FIG. 11. STANDARD ELECTRIC LOCOMOTIVE

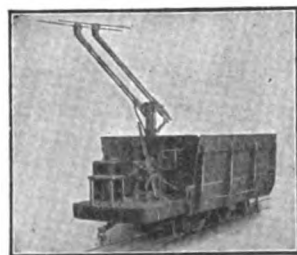


FIG. 12. MOTOR DRIVEN SELF-DUMPING CAR

Cable Railways

Adapted for handling coal and for carrying heavy material from point to point. Used extensively in conveying coal from barge to storage bins. Standard gage, 21½ in.; curve radius, 12 and 30 ft.

Hunt's Automatic Railway

Designed primarily for transporting coal, sand, rock, cement and similar bulk materials from railway cars or vessels to storage bins where run does not exceed 600 ft. Operation is entirely automatic. Time consumed for round trip of 300 ft., dumping its load and returning, is about 50 seconds. Requires services of only one man—the craneman.

In operation, loaded car is started down an inclined track, and a few feet ahead of discharging point picks up a cross bar which is attached to a cable leading to a weight box. This raises weight box and when load is discharged from car the reaction due to falling weight returns empty car to loading point.

Two sizes of cars are manufactured: 1-ton and 2-ton capacity. Made of wood, lined with sheet steel.

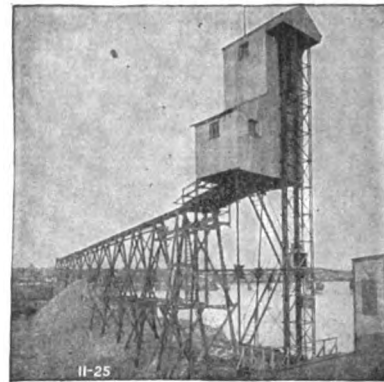


FIG. 13. HUNT SKIP HOIST AND AUTOMATIC RAILWAY

Skip Hoists

Consist of load-carrying bucket, wire hoisting rope, head and leading sheaves, electric single drum hoisting engine with motor, traveling cam control and electrically operated brake, bucket guides, loading pit valve or loading chute, control panel and push button station for operating machine.

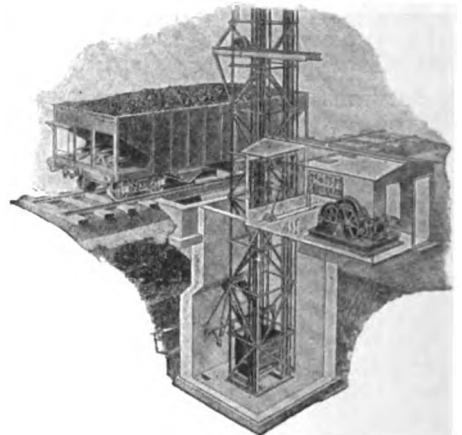


FIG. 14. STANDARD SKIP HOIST

Single bucket skip is counterweighted and guides constructed for properly guiding counterweight and bucket. Electric skips with drum type controller and steam hoist friction operated skips of high speed can be furnished if desired. Skip hoists can be operated equally well whether vertical or inclined. Capacities from 25 to 300 tons per hour.

Overhead Weighing Larries

Built to meet existing conditions with one way or bifurcated chutes to serve a single or double line of stoker hoppers. Accurate records of coal consumption registered on cards. Manually or electrically operated either from boiler room floor or cab. Capacities, ½ ton and up.



FIG. 15. OVERHEAD WEIGHING LARRY

Conveyors

The Hunt pivoted bucket conveyor carries bulk material, dry or liquid, noiselessly in any direction without shock, breakage or violence. Three types of conveyors are manufactured: "Standard," with independent buckets, being separately filled; "Continuous," with edges of buckets in contact; "Lip Type," with edges of buckets overlapping—material being spouted into conveyor in constant stream without spill or scatter.

Buckets are suspended on pivots so that gravity keeps them upright whether track be horizontal, vertical or inclined. Conveyor is driven by pawls which run smoothly on driving pins on chains. Whole conveyor designed for thorough lubrication of all bearings.

Capacity is secured not by speed but by enlarged bucket. Operation entirely automatic. All parts interchangeable. Conveyor will operate on 5 to 10 h.p.

Special automatic machinery is designed for filling each "Standard" type bucket with definite quantity of material. Several fillers can be arranged for measuring and mixing different materials.

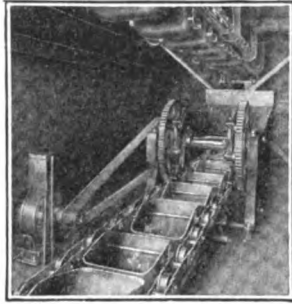


FIG. 16. INSTALLATION OF PIVOTED BUCKET CONVEYOR

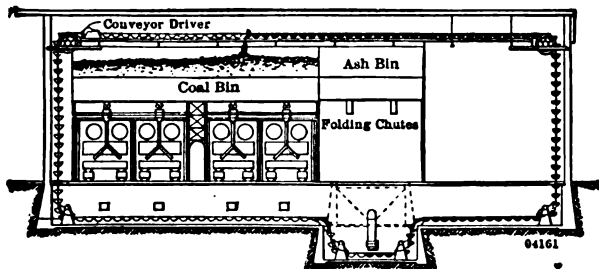


FIG. 17. SECTION THROUGH A POWER PLANT EQUIPPED WITH HUNT PIVOTED BUCKET CONVEYOR

Coal Crackers

Designed for breaking lump bituminous coal into pieces small enough to feed through automatic stokers. Rolls have hardened steel chisel points that split or crack instead of crushing the lumps. Steel points renewable. Bearings and mechanisms protected from dust. Cracker may be placed below hopper under railway car track, so that coal feeds directly from car into conveyor. Can also be suspended from overhead beams, or be supported from below. Steam or electrically operated.

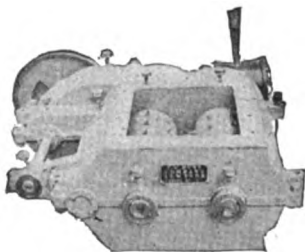


FIG. 18. COMPLETE COAL CRACKER

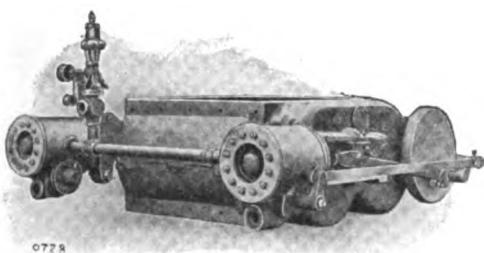


FIG. 19. HUNT STEAM DRIVEN COAL CRACKER

Cut-off Valves or Gates

For controlling flow of coal, broken stone, sand, etc., from storage bins to mechanical stokers, mixers or cars. Installed at side or bottom of bins, or at end of spout. Hand operated by single lever, but power can be applied to larger sizes. Have no sliding parts or gears, but jaws rotate on centers, cutting through material without jamming. Normal tendency of valve is to close automatically by gravity. Almost every requirement may be met with standard types or modifications.

Fig. 22 shows a low body duplex valve with outside flanges particularly suitable for ash hoppers. If the conditions are unfavorable for the operator of any other type of cut-off valve, these duplex valves will be successful. They are heavily built and are not quickly burned out.

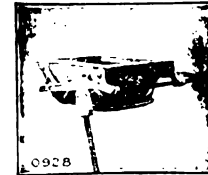
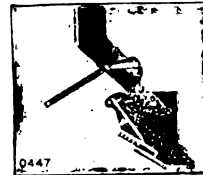
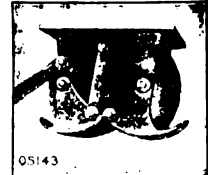


FIG. 20. CUT-OFF VALVES

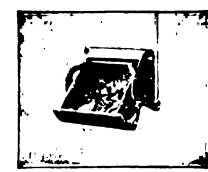
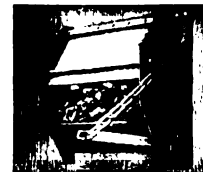


FIG. 21. VALVES AND CHUTES

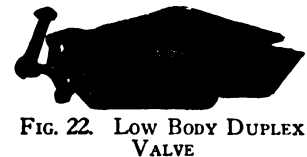


FIG. 22. LOW BODY DUPLEX VALVE

Steel Coal Tubs

For unloading coal, stone, ore, etc., from canal boats and in similar uses. Approximately spherical in shape, fitted with side or back lever catch. Strongly made of heavy steel plate, top heavy when loaded, bottom heavy when empty and low in height—easily loaded and dumped. Capacities, 1/6 to 1 ton of coal.

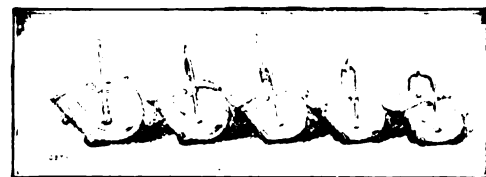


FIG. 24. HUNT STEEL COAL TUBS

"Stevedore" Transmission and Hoisting Rope

This rope is made of selected Manila fiber treated with a plumbago and tallow lubricant to reduce wear. With our "Stevedore" transmission rope we supply the Hunt coupling for controlling the stretch of ropes and eliminating splicing. "Stevedore" hoisting rope is designed for heavy hoisting purposes and is made cable-laid for well drilling.

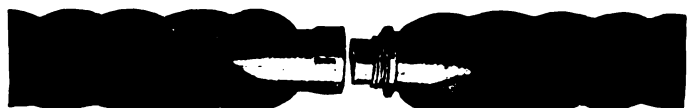


FIG. 23. HUNT TRANSMISSION ROPE COUPLING

EASTON CAR & CONSTRUCTION COMPANY

Industrial Cars and Portable Railway Equipment

190 Fulton Street
NEW YORK, N. Y.

AGENTS

PHILADELPHIA, PA.
SALT LAKE CITY, UTAH

BIRMINGHAM, ALA.
SAVANNAH, GA.

NORFOLK, VA.
ST. LOUIS, MO.

TAMPA, FLA.
TORONTO, ONT.

Products and Services

INDUSTRIAL CARS.
RAILS and PORTABLE TRACK.
SWITCHES and CROSSINGS.
TURNABLES.
WHEELS and AXLES.

This company designs and builds narrow gauge cars for all purposes. It furnishes everything required for a complete installation, either to its own or to customers' drawings and specifications, including every industrial railroad accessory.

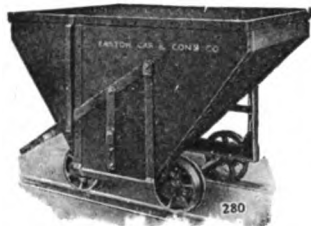


FIG. 280. SIDE DISCHARGE CAR



FIG. 3530. ROCKER DUMP TRAILER

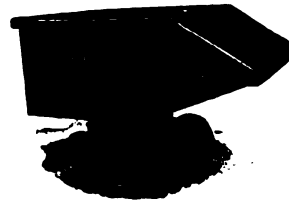


FIG. 5159. SCOOP CAR



FIG. 269. SKIP CAR



FIG. 430. SPECIAL SIDE DISCHARGE CAR



FIG. 1886. END DISCHARGE CAR

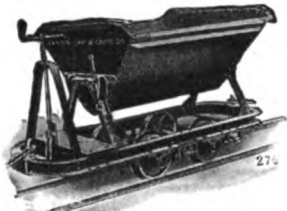


FIG. 276. CRADLE DUMP CAR



FIG. 974. ROCKER DUMP CAR

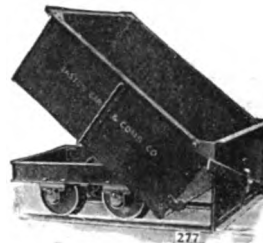


FIG. 277. END DUMP CAR



FIG. 264. PIG IRON CAR

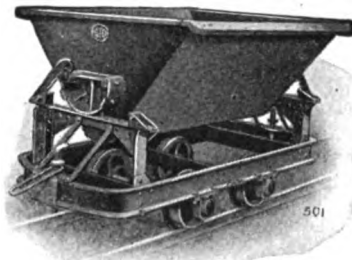


FIG. 501. ROCKER DUMP CAR



FIG. 403. MINE CAR FOR HEAVY WORK

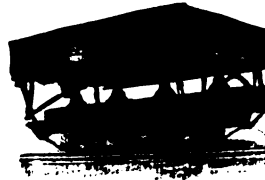


FIG. 146. CONTRACTORS' CAR



FIG. 435. GABLE BOTTOM CAR



FIG. 226. HOPPER BOTTOM CAR

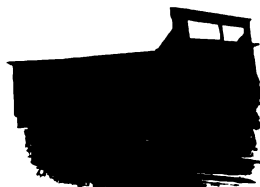


FIG. 184. QUARRY CAR

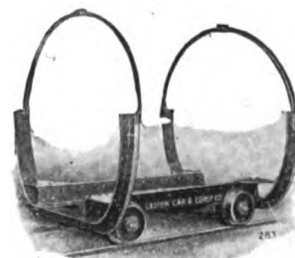


FIG. 283. CREOSOTING CAR



FIG. 147. SUGAR CANE CAR



FIG. 73. STANDARD COAL CHARGING CAR



FIG. 425. COAL CHARGING TRAILER



FIG. 1005. STANDARD PLATFORM CAR



FIG. 273. BILLET CAR



FIG. 284. TRANSFER CAR



FIG. 266. CORE OVEN CAR

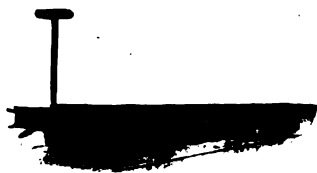


FIG. 1533. PLATFORM CAR



FIG. 2694. CHARGING BOX CAR



FIG. 99. STANDARD PUSH CAR



FIG. 448. WHEELS AND AXLE



FIG. 185. CAST IRON PLATE SWITCH

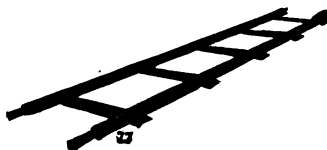


FIG. 77. INDUSTRIAL TRACK

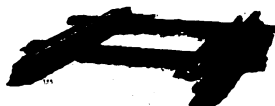


FIG. 135. CROSSING



FIG. 81. EASTON TWO-WAY SWITCH



FIG. 2665. TURNTABLE



FIG. 75. STEEL TIES



FIG. 94. STANDARD TURN-TABLE



FIG. 494. GASOLINE LOCOMOTIVE

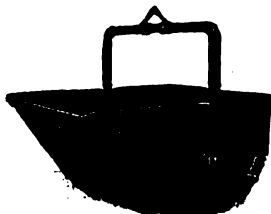


FIG. 1047. DUMP BUCKET

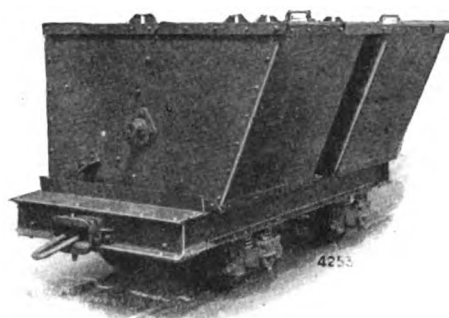


FIG. 4253. BUCKET CAR



FIG. 5194-A. AUTOMOBILE TURNTABLE

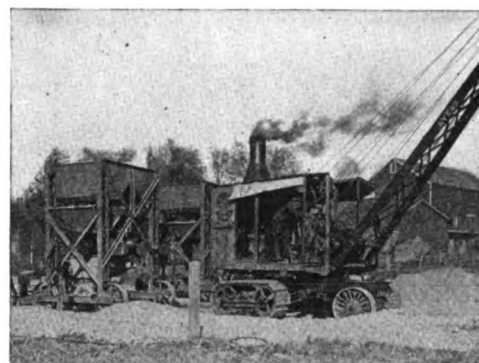


FIG. 624. PORTABLE AND STATIONARY BINS

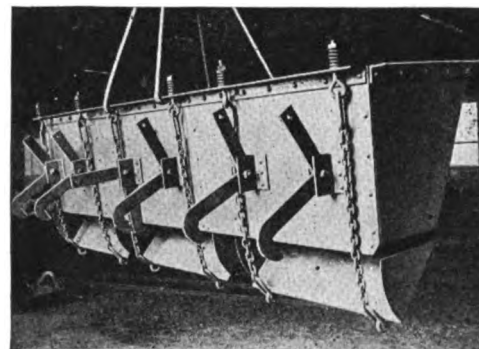


FIG. 5326-C MEASURING HOPPERS

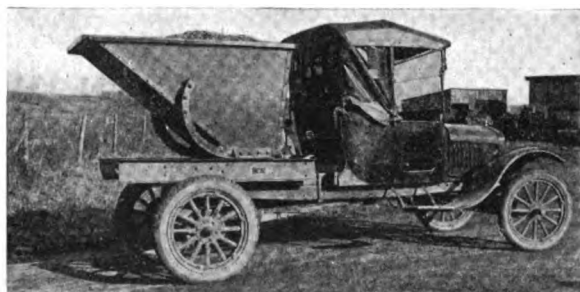


FIG. 191. EASTON ALL-STEEL ROLL-OVER BODIES FOR ANY MAKE OF TRUCK



FIG. 111. EASTON ALL-STEEL SCOOP BODY FOR FORD TRUCKS

LAKEWOOD ENGINEERING COMPANY

Narrow Gauge Cars, Track and Switches

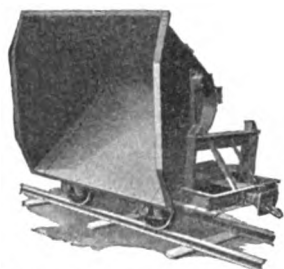
CLEVELAND, OHIO

For District Offices, see page 41

Products

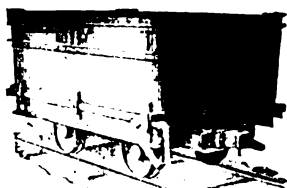
INDUSTRIAL RAILWAY EQUIPMENT.

For Clamshell Buckets, see page 41; for Industrial Locomotives, see page 890; for Industrial Tractors and Trucks, see page 899.



V-DUMP AND ROCKER DUMP CARS

Built to standard Lakewood specifications or to meet special requirements

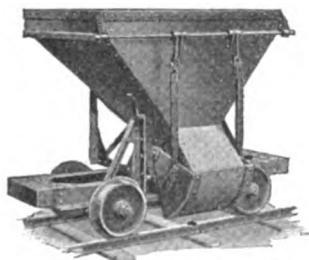


GABLE BOTTOM CARS
Standard or special designs

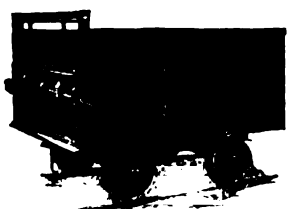


COMBINATION FLAT AND BOX CARS

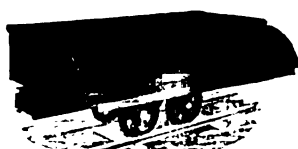
Furnished with or without sides, for any gauge



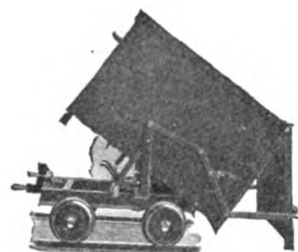
RADIAL GATE HOPPER CARS
For handling ice, sand, coal, ashes, etc.



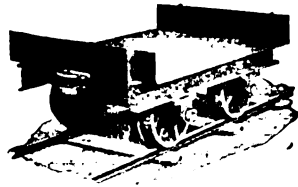
QUARRY CAR, END DUMP
Several standard types. Also made to order



CHARGING CARS
For handling coal, ashes, coke, etc.



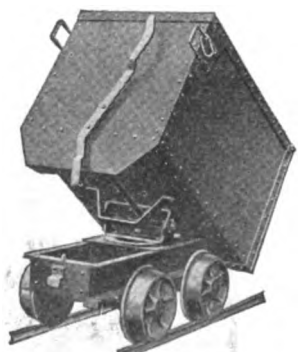
END DUMP CARS
All-steel construction; standard or special designs



PIG IRON CARS
Furnished with or without sides or ends



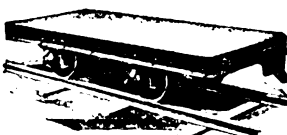
ELECTRIC OR HAND TRANSFER CARS
All capacities, sizes and gauges



MINE CAR FOR HEAVY HANDLING
Frame revolves on swivel. Automatic gate



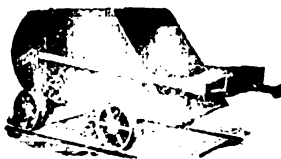
STEEL INGOT CAR
For handling sheets, bars, billets, etc.



PLATFORM CAR WITH STEEL OR WOOD TOP
For various track gauges



WOOD PRESERVING CAR
Other types for handling paving blocks



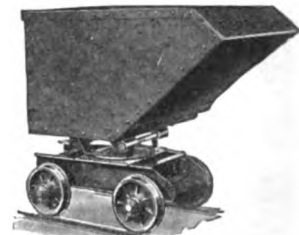
SKIP CAR FOR INCLINED TRACK
One of several Lakewood designs. Made to specifications if desired



HEAVY DUTY CORE OVEN CAR
Other standard types for various gauges. Made to specifications when desired



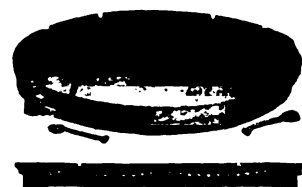
DOUBLE TRUCK CAR
10-ton capacity, for heavy service in steel mills



ROTARY SCOOP CAR
For use where sharp dumping angle is required. All-steel construction heavily reinforced



CAR FOR HANDLING CHARCOAL
One of several types



TURNTABLE
Turning on ball bearings, as shown. All types



TRACK, BOLTED OR RIVETED
With crimped or heavy pressed steel ties. Made up in straight or curved sections



SWITCHES OF ALL TYPES

Catalogue

The Lakewood No. 16 Car Book shows several hundred types of Lakewood cars. It is a regular car encyclopedia. Sent free on request to those interested.

THE BAKER R & L COMPANY

Manufacturers of Baker Industrial Tractors and Trucks

MAIN OFFICE AND FACTORIES
CLEVELAND, OHIO

Products

ELECTRIC TRACTORS and TRUCKS for inter-department, factory and special phases of industrial material handling and transportation.

ELECTRIC TRACTORS AND TRUCKS
Baker
TRADE-MARK

Scope of Usefulness

The average Baker installation makes a saving of 75% in the cost of material handling over the cost of hand truckage. Repeated analyses of savings accomplished by Baker industrial machines show that the average saving per machine in 6 months is more than their first cost. Practically 60% of all Baker sales are repeat orders from satisfied customers.

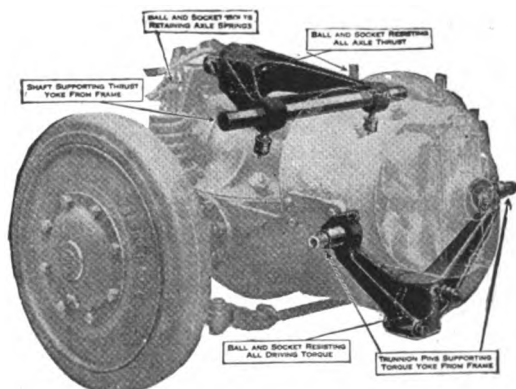
Continuity of Service

It is vital to a purchaser to know that the machine he buys will stay in service day after day and not be out of commission when badly needed. Baker tractors and trucks are ruggedly constructed to meet the most severe usage. Virtually all parts are inter-standardized, allowing easy replacement on any of the models.

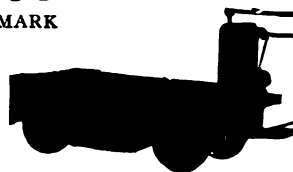
Duplex Compensating Suspension

The outstanding feature of Baker design, aside from its sturdy construction, ample power and inter-standardization of parts, is the exclusive duplex compensating suspension. By a unique combination of ball-and-socket joints with a driving yoke and torque yoke, proper resistance against torque and driving strains is insured and yet the springs are free to cushion the vehicle and load from road shocks. The Baker design is the only axle suspension for power vehicles which definitely meets all requirements.

Detailed specifications on any of the models here illustrated gladly furnished on request.



THE DUPLEX COMPENSATING SUSPENSION—AN EXCLUSIVE BAKER FEATURE



BAKER UTILITY TRUCK
Capacity, 4000 lbs. Load carrying truck; 2-wheel drive, 4-wheel steer. New uses for this truck are discovered every month



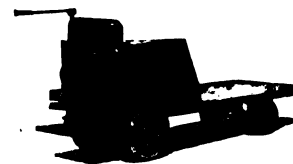
BAKER 3-WHEEL TRACTOR
Rated drawbar pull, 300 lbs. Starting drawbar pull, 1800 lbs. Speed, 1 to 6 1/2 miles per hour. Trailing load, from 7 1/2 to 15 tons



BAKER INDUSTRIAL TRACTOR
Rated drawbar pull, 400 lbs.; starting drawbar pull, 1500 to 3000 lbs.; 2- or 4-wheel drive, 4-wheel steer. Speed, 2 to 6 miles per hour. Will haul a trailing load of from 10 to 20 tons



BAKER DUMP BODY TRUCK
Roll-over V type or end dump bodies of 27 or 40 cu. ft. capacity are furnished with this truck



BAKER LOW PLATFORM TRUCK
Capacity, 4000 lbs. Load carrying truck, 2-wheel drive, 4-wheel steer. A modified utility truck of wide usefulness



BAKER ELEVATING TRUCK
Capacity, 4000 lbs. 2-wheel drive, 4-wheel steer. An auxiliary electric motor elevates and lowers the load platform 4 1/2 in. in 10 seconds



BAKER JIB CRANE
Capacity, 1500 lbs. Both boom and load hoists are separately controlled from the dash



BAKER SWIVEL HOIST TRUCK
Truck capacity, 4000 lbs.; hoist capacity, 1000 or 1500 lbs. Both the truck and the hoist are electrically driven by separate motors

THE ELWELL-PARKER ELECTRIC CO.

Electric Industrial Trucks and Tractors

4200 St. Clair Avenue
CLEVELAND, OHIO

OFFICES IN PRINCIPAL CITIES

Product

ELECTRIC STORAGE BATTERY INDUSTRIAL TRUCKS of the Tractor, Elevating Platform or "Self-loading," Carrier, End Dump, Revolving Crane, Rocking Crane, Straight and Drop Frame Types, for rail or floor.



TRADE-MARK

Inquiries and Catalogue

Always state kind and amount of material to be moved per hour, length of haul, percentage and length of inclines, and size and capacity of elevators.

Request Catalogue 1202.

Applications

Used inside buildings; in yards or across streets; on inclines, elevators, bridges, or through tunnels at steel, tin plate, paper, cotton, textile and lumber mills; clay working, salt, sugar, chemical, automobile, fertilizer, leather, rubber, glass and power plants; foundries, machineries; factories; hospitals; shipyards; warehouses, piers, railroad and marine passenger and freight terminals, for quick, economical inter-department transfer of materials. It matters little what the commodities are, electric trucks can be used to handle them at less expense—first cost, maintenance and adaptability to present manufacturing conditions considered.

Operation and Original Features

Elwell-Parker trucks and tractors steer on all 4 wheels, and are 2- or 4-wheel drive. Edison or lead battery furnishes power to totally enclosed drum type controller and motor. Motor drives through single reduction free coasting worm gear to large diameter solid rubber tired wheels. Battery assembled in a box, may be charged in the truck or removed and charged, or exchanged for one already charged. Battery capacity sufficient for 15 to 20 miles operation, or the average day's work in a factory. Charge from alternating or direct current line. Power cost, about 25c per day.

Patent interlocked control is so arranged that truck or tractor can not be started except when operator is standing on pedals or sitting in seat. Motor will take entire battery charge. Power may be applied with brakes set—important when starting on inclines. When operator steps from truck, same will stop within its length.

Speeds 400 to 700 ft. per minute. Carrying capacity of trucks 4000 lbs. Draw bar pull of tractors 6 to 60 tons. Self-loading trucks will pick up 4000 lbs. in 10 seconds. Revolving cranes on trucks lift 1000 to 3000 lbs. Dump trucks with 36 cu. ft. end dump, and 40 cu. ft. side dump bodies. Platform heights range from 11 to 33 in.; lengths from 4 to 11 ft.; widths 2½ to 3½ ft.

Universally Used

Elwell-Parker haulage units are backed by the longest actual experience in this industry. All types incorporate the most recent electrical and mechanical improvements developed in the automotive and machine tool industries.

One man with a lift truck has handled 125 to 150 4000-lb. loads on separate platforms, a distance of 400 to 500 ft. per day.

Another man with a tractor has transferred 275 tons of bagged goods a distance of 1800 ft. in 7 hours.

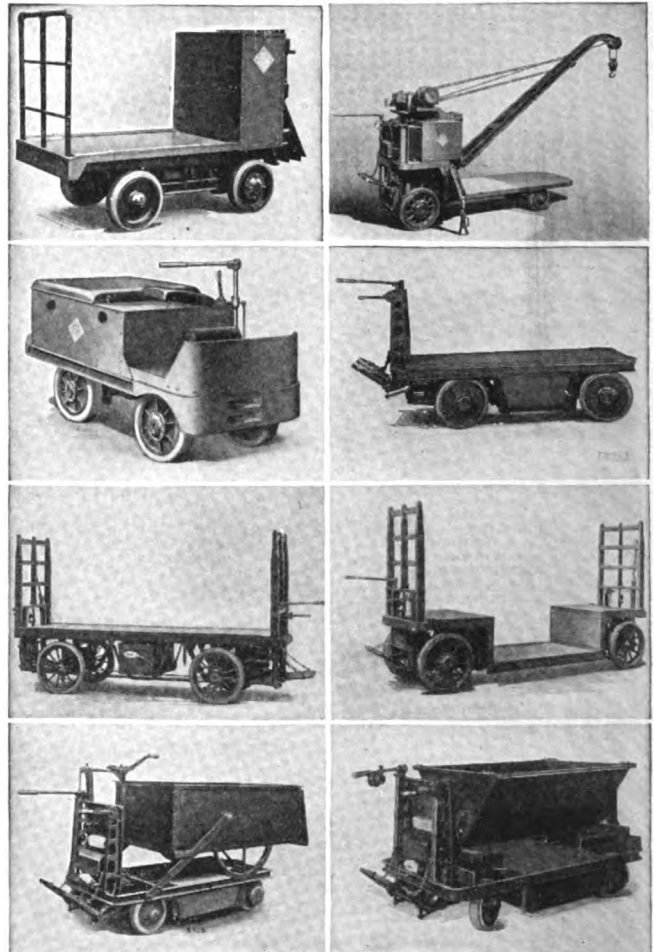
A crane truck saved \$27.70 per day for one user stacking castings in the storage yard.

Points of Superiority

Fewest parts. No delicate parts. Interchangeable parts. Largest wheels. Greatest clearances. Interlocked control. Greatest mileage. Lowest upkeep.



LIFT TRUCKS HANDLING SEPARATELY LOADED PLATFORMS



VARIOUS TYPES OF ELECTRIC STORAGE BATTERY TRUCKS
Tractor in lower illustration handling 10 loaded trailers

LAKEWOOD ENGINEERING COMPANY

Industrial Tractors and Trucks

CLEVELAND, OHIO

For District Offices, see page 41

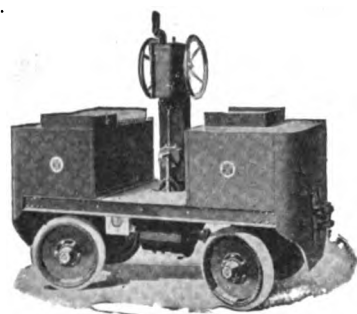
Products

INDUSTRIAL TRAILERS, TRACTORS, and TRUCKS.

For Clamshell Buckets, see page 41; for Industrial Locomotives, see page 890; for Industrial Railway Equipment, see page 896.

Storage Battery Tractor

Patterned after the electric locomotive, both ends the same. Each end has heavy bumper and coupling and will pull or push in either direction. Turns on a radius of 61 in., making possible rapid operation in congested places. The double end control feature eliminates turning around, enabling the operator to run straight into a coupling and pull out by simply reversing his driving position. No backing out required.

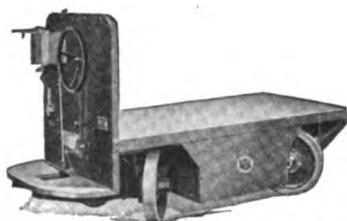


STORAGE BATTERY TRACTOR

The four-wheel drive and steer features give maximum driving power for hauling heavy loads up grades or over slippery floors, straight ahead or on sharp turns.

Storage Battery Truck

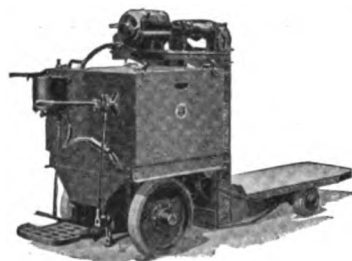
Equipped with a V-dump body or a flat top. The four-wheel drive gives maximum tractive effort when hauling up grades or over slippery floors. Turns in a radius of 61 in. All parts accessible. Batteries carried in steel compartment underneath deck at each side of the driving motor.



STORAGE BATTERY TRUCK

Lift Truck

The Lakewood lift truck is of the self-loading type. The load is piled on a skid or on the truck platform. When skids are used, the truck picks up the skid, carries it to some distant part of the plant and quickly returns for another load. The truck with one operator easily performs the work of several men. Positive worm-drive elevating mechanism enables operator to carry loaded platform skid at any elevation from the minimum of 11 in. to the maximum of 42 in.; eliminates danger of skid legs dragging in passing over depressions and enables operator to set skids on benches convenient to machine operators.



LIFT TRUCK

Tier Lift Truck

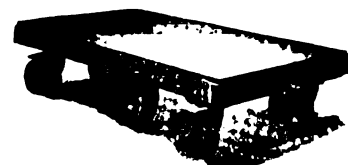
The merit of this truck has been proved in such diversified industries as steel mills, cotton mills, printing plants, automotive shops, chemical plants, foundries, warehouses, etc. It will load or unload trucks or cars from the ground level. Places heavy dies on machines in forge shops. It saves five to ten men in tiering and storing materials. Transports material up steep grades. Built in tiering heights of 60, 76 and 96 in.



TIER LIFT TRUCK

Balanced Type Trailer, Model 802

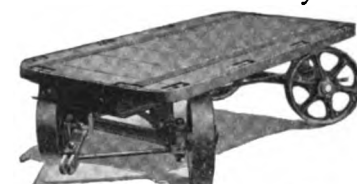
For general factory use where both power and hand haulage are necessary. Load being balanced on two center wheels, minimum effort is required to swing trailer around. May be pulled or pushed by tractor. Capacity, 8000 lbs. Hyatt roller bearings on center wheels, plain bearings on caster wheels.



BALANCED TYPE TRAILER, MODEL 802

Four-wheel Steer Trailer, Model 801

Designed for accurate trailing in trains of from 2 to 10 trailers. The large wheels make the trailers easy rolling over rough floors. Cage roller bearings in all four wheels. Wheels are provided with automobile type steering knuckles. Platform, 3 by 6 ft. Capacity, 6000 lbs.



FOUR-WHEEL STEER TRAILER, MODEL 801

Warehouse Type Trailer, Model 810

Almost unbreakable construction insured by the use of steel and malleable iron. Platform, 72 by 36 in. Capacity, 4000 lbs. Hyatt roller bearings on all wheels; ball thrust bearings on casters.



WAREHOUSE TYPE TRAILER, MODEL 810

Low Platform Type Trailer, Model 804

Efficient for handling heavy boxes or bulky material. 9-in. loading height. Adapted for hand or power haulage, over smooth runways or floors. Capacity, 5000 lbs. Cage roller bearings on all wheels.



LOW PLATFORM TYPE TRAILER, MODEL 804

BARRETT-CRAVENS COMPANY

Industrial Material Handling Equipment

1322 West Monroe Street

CHICAGO, ILL.

NEW YORK, N. Y., Grand Central Palace

Products

LIFT and TRAILER TRUCKS; STEELEG PLATFORMS; GASOLINE TRUCKS and TRACTORS; PORTABLE CRANES; BARREL TRUCKS.

Barrett Lift Trucks

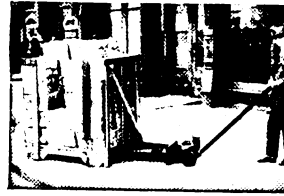
Made in sizes and models to suit all industries. Noted for their simplicity of design, safety, ease of operation and long life. Built from the finest materials; all parts subject to wear or stress are over size. Hyatt roller bearings throughout; all parts riveted, not bolted. Easy lift and light pull.

Unusually sturdy and staunch in construction and guaranteed to withstand rough usage.

Enable One Man to Do the Work of Five— Where Barrett lift trucks are used, all materials to be moved are loaded on wooden platforms or racks. The Barrett lift truck is rolled beneath the loaded platform or rack, the entire load is elevated with a downward thrust of the handle, the load is moved to its destination and, at a touch at the release latch, entire load is gently lowered to the floor. The truck is then withdrawn and is ready for moving another platform. The entire operation is simply and quickly performed and unnecessary handling and expense of providing a large number of old style hand trucks is eliminated.

Briefly, the Barrett system of transporting materials accomplishes saving in labor, time, investment, space and spoilage. In addition, there is a contributory saving that inspires neatness and efficient movement of material which is an incentive to all employees. There is no careless piling of stock through unsystematic handling. Materials will move through the plant just as you want them and with the least confusion and cost.

Perhaps you have already installed lift trucks of other makes and would like to have information on the Barrett for comparison. This we cheerfully furnish.



BARRETT LIFT TRUCKS IN USE

To Select Proper Model—Consider the following factors when selecting a truck:

(1) Condition of floor: For smooth hardwood or cement floors, specify 6-in. or 7-in. wheels; if floors are uneven, 9-in. wheels should always be specified. Under all conditions, 9-in. wheels are most satisfactory. (2) Inclines: For trucking over inclines or sills, specify 2½-in. lift models; under ordinary conditions, specify 1¾-in. lift models. (3) Maximum dimensions of load: Length and width of carrying frame of truck depends upon size of wooden loading platform. (4) Maximum load capacity: Ascertain load by actual weighing and then refer to accompanying table.

BARRETT LIFT TRUCKS

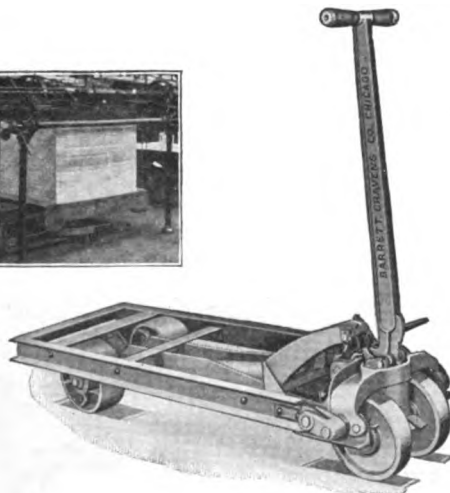
Model	M	D	DK	H	Y
Capacity, lbs.....	2000	3500	3500	5000	5000
Width, in.....	17½	17½	24	20	27
Length carrying frame, in.....	30 to 36	30 to 60	30 to 60	36 to 72	36 to 72

Wheel diameter, 6, 7 or 9 in. on any model.
Elevation, 1¾ in. standard on all models; special models, 2½ in.
Height of truck lowered, same as wheel diameter, except that H and Y models can be made with 9-in. wheels and truck lowered to 10, 10½ or 11 in. to fit electric lift truck platforms. Special trucks made any length, width, and capacity up to 15,000 lbs.

Partial List of Users—

Swift & Co.
Magnus Metal Co.
U. S. Gypsum Co.
American Brake Shoe
& Foundry Co.
Johns-Manville
Cadillac Motor Car Co.
Firestone Tire & Rubber Co.
International Harvester Co.
Karle Lithographing Co.
Victor Talking Machine Co.
R. J. Reynolds Tobacco Co.
Dodge Bros.

Murphy Chair Co.
Loft Candy Co.
National Lead Co.
Pevly Dairy Co.
Eastman Kodak Co.
Buick Motor Car Co.
Bethlehem Steel Co.
Hammermill Paper Co.
Oliver Typewriter Co.
Western Electric Co.
L. E. Waterman Co.
Yale & Towne Mfg. Co.



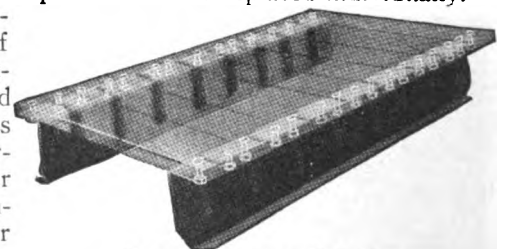
H MODEL BARRETT LIFT TRUCK

Barrett Steeleg Platforms

Legs are one solid piece of pressed steel with deep corrugations 6 in. apart. Topboards are attached with special bolts giving a perfectly smooth top surface, vitally important in handling paper stock.

Damaged topboards can be replaced individually.

Send specifications of present platforms and quotations will be furnished for platform complete or for legs only.



BARRETT STEELEG PLATFORM
Embodies strength, durability and simplicity

Powerox Gasoline Truck and Tractor

The industrial tractor that will carry a load up to 3000 lbs. or pull a train of trailers up to 40,000 lbs. at a speed of from 1 to 10 miles per hour, speed being increased by adjusting governor. Strong, sturdy, easy to operate and economical. Designed and built to perform many years of heavy duty in factory, dock, freight terminal and warehouse service and for light and medium construction work.

The Powerox is compact (about 4x8 ft. over all), yet has full size truck units and is built up to 1½-ton truck specifications. There are many types of bodies. Write for full details and specifications.

Powerox Features—Engine clutch and transmission form a unit power plant, located in front. Driver's seat (spring mounted) located over a Renault type



TRADE-MARK

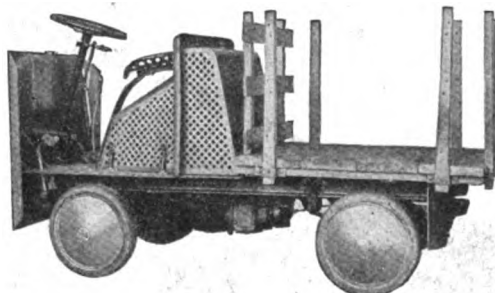
hood gives driver a clear view and utilizes waste space. Radiator placed at rear of engine; is spring mounted and enclosed in heavy steel plate housing. Its location protects it from damage by collision and minimizes effects of frame distortion.

Power applied to rear wheels through a worm gear drive rear axle of the fully enclosed type. Housing constructed of a heavy one-piece electric steel casting. Drive transmitted from rear axle through rear springs, giving a flexible cushioned action when starting heavy loads. Spring semielliptical and flat under load. Power transmitted from engine through straight line drive universal shaft direct to rear axle. Elliot type front axle of heavy I-beam section.

Front wheel steer. Steering gear located forward of front axle, steering column raking back at a convenient angle for the driver. The straight, all-steel base permits very short turning radius. Foot pedals and hand controls conveniently located.

Provision is made for easy and ample lubrication of all working parts. Solid wheels with convex faces, eliminating danger of scraping doorways, etc.

Unit power plant consists of 25 h.p. engine, four 3½x4½-in. "L"-head type cylinders cast en bloc, removable cylinder heads, enclosed valves, circulating oil pump, thermo-siphon cooling system, speed governor, high tension magneto with fixed spark, 3-point suspension. Especially suited for heavy duty service on account of high torque at low engine speed.

**POWEROX TRACTOR WITH STAKE BODY**

Wheel base, 60 in. Turning radius, 10 ft.
Length over all, 98 in. Shipping weight, 2500 lbs.
Tread, 36 in. Radiator to rear, 42 in.
Width over all, 44 in.

Barrett "Never-slip" Portable Crane

A new development in portable cranes with a worm and screw hoist.

This hoist automatically locks at all points of travel, eliminating all possibility of accidents. Operated by a chain by one man with absolute safety.

Easy lift, long life, simple operation.

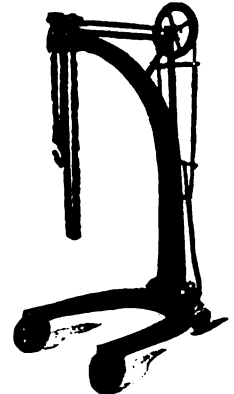
Guaranteed to give the greatest service with least wear.

Handles materials with the greatest precision, even to one-thousandth of an inch.

Base and column are steel castings. Worm gear is of bronze,

BARRETT PORTABLE CRANES

Size No.	Height over all ft.-in.	Lift ft.-in.	Overhang, ft.-in.	Bed						Weight, lbs.	Capacity, lbs.		
				Width			Length, ft.-in.	Height, in.					
				Out- side, ft.-in.	In- side, ft.-in.								
1	7-1	5-0	2-5	2-10	2-0	4-2	8			565	200		
2	7-9	5-0	2-9	3-4	2-5	4-9	10			710	400		
3	8-8	6-6	2-11	3-10	3-0	5-1	10			990	500		
4	9-8	7-8	3-2	4-6	3-5	5-3	10			1200	600		
5	11-1	9-6	5-8	4-4	3-4	6-1	12			1400	650		
6	12-0	9-3	6-8	4-4	3-4	6-6	12			1700	700		



BARRETT "NEVER-SLIP" PORTABLE CRANE

screw cut from solid steel shafting; both enclosed in oil-tight cast housing.

Steel sprocket designed with a wide factor of safety over guaranteed capacity. Chain is electric welded; axles are of chrome nickel steel, heat treated, and can not crystallize.

Hyatt roller bearings in all wheels—a boy can pull the heaviest load. Chilled tread on wheels gives hard surface for long wear; soft web for strength. Standard railroad car wheel construction.

Barrett Barrel Truck

A marvelously efficient hand truck for easily and quickly handling barrels of all types weighing as much as 1200 lbs.

The truck, not the operator, lifts the load.

Operator pushes toes of truck against base of barrel, throws handles up parallel with side of barrel, whereupon the bail automatically drops down over top of barrel; then by pulling down on the handles, the barrel tilts easily over on the truck and operator rolls it away, merely balancing the load as he pushes it.

No prongs or points to injure barrel or operator. Hyatt roller bearings insure easy rolling. If truck handles are accidentally dropped, metal feet support the load, preventing spilling of load or injury to operator.



BARRETT BARREL TRUCK

COWAN TRUCK COMPANY

Industrial Trucks and Tractors

8 Water Street
HOLYOKE, MASS.

NEW YORK OFFICE: Grand Central Palace
BRANCH OFFICES IN PRINCIPAL CITIES

Products

COWAN STEEL FRAME SKIDS; COWAN SELF-LOADING HAND TRUCKS; COWAN SELF-LOADING ELECTRIC TRUCKS; COWAN ELECTRIC LOAD CARRYING TRUCKS; COWAN ELECTRIC INDUSTRIAL TRACTORS.

Cowan "Through-Ticket" System

The Cowan "Through-Ticket" system applied to material handling work means:

- (1) Unloading the goods or material from motor truck, freight car, or boat directly on skids.
- (2) The use of skids or skid containers for holding machined parts or other material passing through successive stages of manufacture.
- (3) Storage on skids of goods or materials for future use and shipment or for seasoning purposes.
- (4) The use of Cowan self-loading hand or electric trucks for picking up, moving, and setting down the loaded skids. Used alone or in combination with Cowan electric load carrying trucks or Cowan electric industrial tractors.

The "Through-Ticket" system eliminates the re-handling of goods and materials as they are moved from point to point. Once on skids they are picked up, transferred, and unloaded by one man and a Cowan self-loading hand or self-loading electric truck.

Construction—The present structural features of Cowan trucks and tractors are the result of ten years' study and application of industrial truck systems to factory and other operations.

Utilization—Material handling situations and requirements are so diversified that recommendations for the efficient employment of Cowan trucks and tractors can only be made after thorough acquaintance with each individual problem. A Cowan representative will gladly survey your plant, or if preferred, you can write, giving some idea of the material handling problem, and we will send our preliminary recommendations. This service is without cost or obligation.

Cowan Steel Frame Skids—Cowan steel frame skids are built with the greatest care and of the best materials. Heavy angle iron frame insures utmost rigidity and permanent alignment. Planking of North Carolina pine, four countersunk bolts holding each plank to the frame. Malleable iron shoes solidly riveted to frame. They are long wearing and maintain the skid at its exact and proper height from the floor. By being placed at the extreme ends, maximum skid clearance is secured when passing over obstructions or grades.

Cowan skids nest perfectly in the least possible height and can be shipped knocked down for easy as-



COWAN STEEL FRAME SKID

sembly. Suitable for use with any make of hand or electric lift truck. Special skids or skid bodies.

Cowan Self-loading Hand Trucks

These trucks, in conjunction with skid platforms, offer a quick and economical means of picking up, moving, and unloading materials without rehandling.

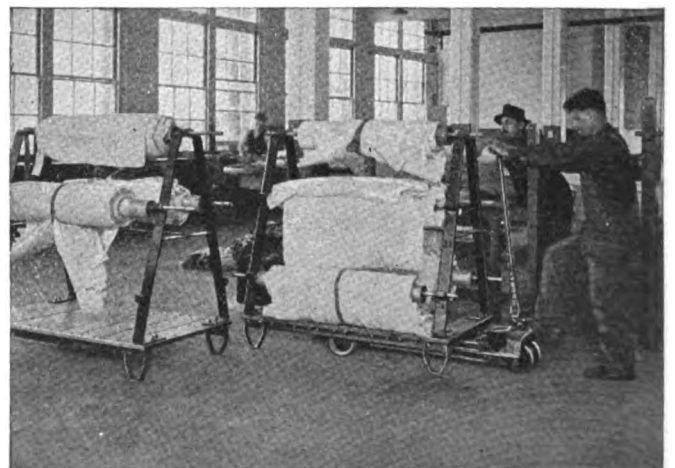
Types G and GB are elevated by a single downward sweep of the handle, which lifts loaded or empty platforms from floor. Load is automatically, gently lowered by merely tripping a foot pedal.



COWAN HAND TRUCKS, NARROW AND BROAD FRAME TYPES, THREE- OR FOUR-WHEEL MODELS, HIGH AND LOW LIFT

Frame of type GB is $24\frac{7}{8}$ in. wide; $7\frac{7}{8}$ in. wider than that of G, as it is intended for handling unwieldy and more bulky loads. Types G and GB lift is $1\frac{1}{2}$ in., but there are variations of each type, known as "high lift types GH and GBH," each with a lift of $2\frac{3}{4}$ in. Additional height of load above floor or ground is an advantage in traveling over high sills and other floor projections or obstructions. Guaranteed capacity 5000 lbs.

Concerns handling heavy loads ranging from 3500 lbs. upward find that a multiple lift truck such as the Cowan Type "H" is most satisfactory. This type is



THE COWAN SELF-LOADING HAND TRUCK IN USE

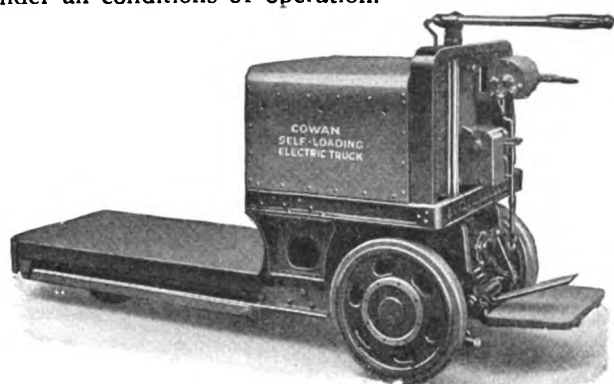
equipped with a hydraulic pump that is used to raise and lower load. A few downward strokes of the handle will elevate maximum load to a height of 3 in. Frame is 27 in. wide. All wheels on Cowan trucks have wide flanges which add materially to stability of truck, at the same time conserving floors on which they travel. There are extra large roller bearings of highest grade in each wheel.

Cowan Self-loading Electric Truck

The lifting mechanism is of the heavy bell crank type. This is an absolutely new application in the construction of electric truck lifting mechanisms. It is actuated by an independent, heavy duty, series wound motor with worm gear reduction. The platform elevates vertically with a maximum rise of $4\frac{1}{2}$ in.

The truck, equipped with full capacity battery, elevates a 5000-lb. load in 5 seconds and without load in 3 seconds. The full lowering time is 3 seconds. This speed in loading and unloading is an important feature of Cowan trucks, for time saved in this way makes a large total for the day.

An "anti-kick" device takes all jar off steering handle when truck travels over rough spots. Rear end of the truck is equipped with a heavy bumper which effectually takes all shocks and protects rear end of lift platform. Tray in which battery rests is supported on springs which relieve cells from vibrations and shocks under all conditions of operation.



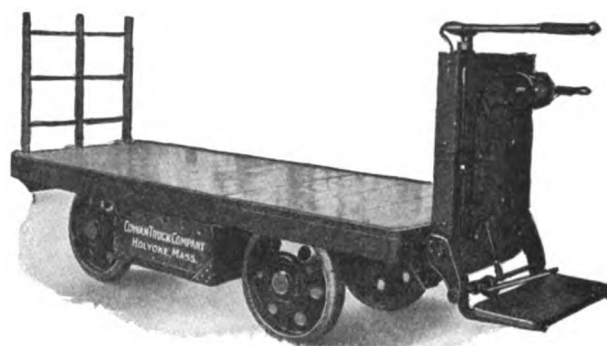
COWAN SELF-LOADING ELECTRIC TRUCK "DOES IT ELECTRICALLY"

The turning radius of this truck, measured to extreme outside point, is 7 ft. $5\frac{1}{2}$ in. This short radius permits truck to operate in intersecting aisles 57 in. wide. By folding the foot pedal and steering handle into a vertical position the over-all length is shortened for use on elevators.

In order to operate, foot pedal must be depressed, releasing brakes and closing circuit. Brakes are always applied when truck is not running. To apply power, controller handle must be in neutral, requiring operator to start in first speed, and thus preventing "snubbing" of motor, sparking under brushes, and draining battery. Should operator step or fall from his platform, releasing pressure on foot pedal, circuit is broken, cutting off power, and brakes are at once automatically applied, bringing truck to a standstill. These features render the truck foolproof against careless or inexperienced operators and meddlers. Rear end of truck is equipped with drawbar attachment for light duty tractor work.

Cowan Electric Load Carrying Truck

For hauling large loads, where extra platform area is required. This large area is obtained by an underslung battery between the front and rear wheels. The few requisite control levers are conveniently arranged and foot pedal must be depressed before truck can be operated. Brake is always applied when truck is not



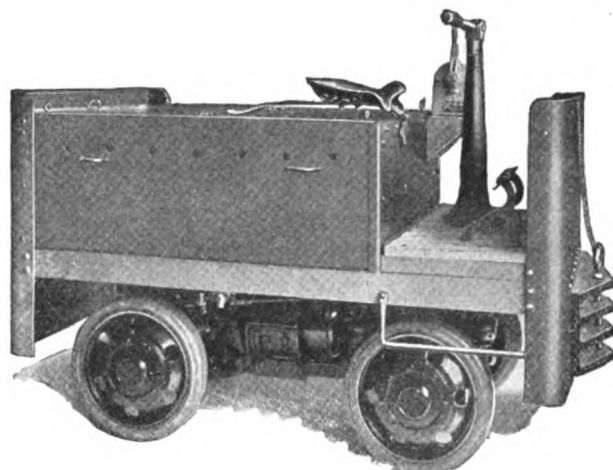
COWAN ELECTRIC LOAD CARRYING TRUCK

running. To apply power, controller handle must be in neutral, requiring operator to start in first speed. Three speeds forward and three reverse, 3 to 5 miles per hour loaded; maximum speed, empty, 8 miles per hour. Horizontal steering lever operates the 4-wheel steer, and intersecting aisles 72 in. wide are readily negotiated. Equipped with the same automatic safety devices as are used in the Cowan electric self-loading truck.

Cowan Electric Industrial Tractor

Guaranteed tractor, load capacity of 20,000 lbs. 4-spring suspension, with extra heavy helical springs. Drawbar pull is transmitted directly through power unit to body. Substantial front and rear bumpers; heavy, vari-height coupling heads. The extra heavy motor will stand frequent overloading. The universal joint is enclosed by a patented, dustproof, greasertight cover.

Ground clearance $4\frac{1}{2}$ in. Four speeds forward and four reverse, up to 7 miles per hour. End control, 4-wheel drive (2-wheel drive optional construction), 4-wheel steer. Turning radius to extreme outside point, 68 in. Tractor will operate in intersecting aisles 66 in. wide. Danger-, fool- and meddler-proof, for controller has an interlocking safety device, and extra large braking surfaces are provided to stop tractor immediately. A train of Cowan self-loading hand trucks will give the greatest satisfaction as trailers. All wheels, bearings, knuckles, and yokes interchangeable.



COWAN ELECTRIC INDUSTRIAL TRACTOR

Cowan Service

We are always glad of the opportunity to confer with plant superintendents and managers regarding material and product handling by use of lift truck and skid system, load carrying trucks and tractors. Our entire experience and data on thousands of our installations are at your service. Catalogues describing any or all of the foregoing products sent on request.

THE CLEVELAND TRACTOR COMPANY

20000 Euclid Avenue
CLEVELAND, OHIO

DISTRICT OFFICES

ATLANTA, GA., 254 Peachtree Street
OMAHA, NEBR., 2518 Farnam Street
MINNEAPOLIS, MINN., 714 Washington Avenue, North
OKLAHOMA CITY, OKLA., 515 West Main Street
SPOKANE, WASH., 30 East Sprague Avenue

CHICAGO, ILL., 2025 South Michigan Avenue
LOS ANGELES, CAL., 1029 South Grand Avenue
NEW YORK, N. Y., 225-27 West 57th Street
SAN FRANCISCO, CAL., 147 New Montgomery Street
WINDSOR, ONT., THE CLEVELAND TRACTOR CO. OF CANADA, LTD.

Products

The CLETRAC TANK-TYPE TRACTOR.

Cletrac
TANK-TYPE TRACTOR
TRADE-MARK

Specifications and Rating

Motor—4-cylinder 4-in. bore; $5\frac{1}{2}$ -in. stroke; protected overhead valves; removable cylinder head.

Ratings—Horsepower, 12 at drawbar, 20 at belt pulley; 1285 lbs. pull at $3\frac{1}{2}$ miles per hour.

Speed—Normal, $3\frac{1}{2}$ miles per hour; variable, from 1 to 4 miles per hour.

Dimensions—Length, 96 in.; width, 50 in.; height, 55 in.; clearance, 12 in.; center to center of tracks, 38 in.

Tractive Service—Two continuous treads joined by hardened pins in rolling steel collars. Length of tractive contact, each side, 50 in.; width, 8 in.; total tractive surface, 800 sq. in.

Weight—Total, with fuel, 3455 lbs., about $4\frac{1}{4}$ lbs. per sq. in. of tractive surface.

Belt Pulley—Diameter, 8 in.; face, 6 in.

Ignition—High tension magneto with automatic impulse starter.

Gas Control—Fly ball governor to butterfly valve at point of intake, fully automatic.

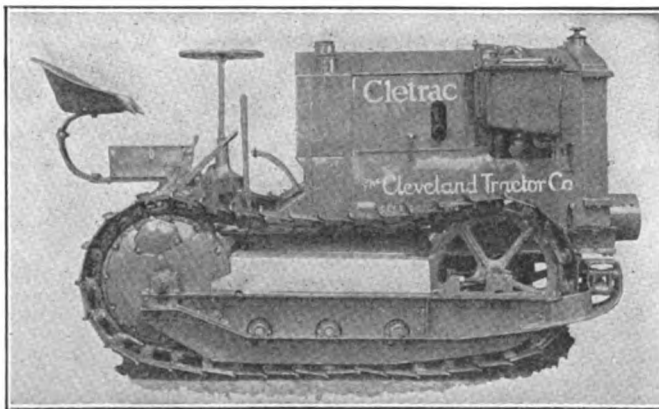
Motor Lubrication—Splash to cam shaft; 3-way oil equalizer direct from oil pump to main crank shaft bearings.

Bearings—Heavy duty Timkin roller bearings in driving wheel, idler and lower track wheels, fully adjustable with special lock nut attachment.

Transmission—Sliding gears, one speed forward, one reverse, forward direct.

Steering—Accomplished by power of the motor through planetary compensating gears—tractor turns in radius of 6 ft.

Air Clarifier—Continuous type cleaner with auxiliary water air washer of special construction.



CLETRAC TANK-TYPE TRACTOR

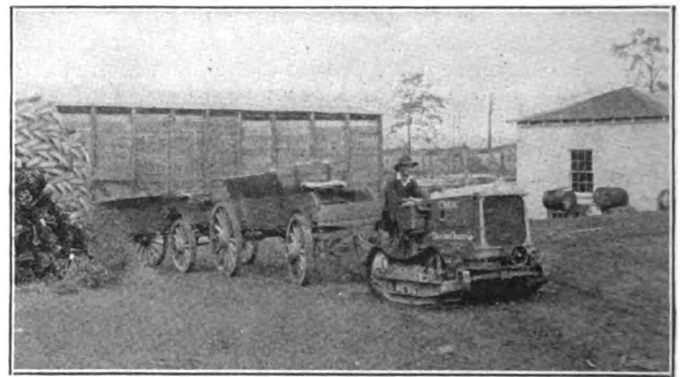
In Shops, Yards and Plants

The Cletrac's value in the shop, yard or plant is the result of its great flexibility and wide working range. It is in a class by itself for rough hauling outside the plant, over loose fills, through mud, snow and slush—anywhere in fact that motive power is required. It will pull a load over footing that is impassable by any other means.

At the same time the Cletrac is just as adaptable to work within the plant. Its ease of control, short turning radius and compactness provide a ready and efficient substitute for electric tractors or small industrial rail-

ways giving equal or greater power at a reduced cost in first investment, operation and upkeep.

Hundreds of Cletracs are at work in foundries, machinshops, storage yards, warehouses and freight terminals, hauling heavy machinery, castings, loaded transfer buggies, scrap carts, dump wagons and spotting freight cars. The representative firms using them have cut their haulage costs materially.



CLETRAC HANDLES HEAVY LOAD ON GRADE

On Contracting and Engineering Jobs

The Cletrac constitutes a part of the contractor's equipment of first importance because of its ability to do the work of horses or mules better, cheaper and quicker. And when the footing is rough, sandy or muddy the Cletrac replaces trucks which are so easily stalled or mired under adverse conditions.



CLETRAC IN GENERAL CONTRACTING OPERATION

On the basis of a day's work in moving materials the Cletrac will replace 6 to 8 horses or mules. At the same time it costs nothing when not in use, saving the expense of care and feeding during the days when animals would be weatherbound and useless. The savings, therefore, are derived from a greater amount of

work per day, more days of work—for the Cletrac is not stopped by mud, sand or snow—and a greatly reduced upkeep and labor expense.

Many contractors have also found the Cletrac invaluable as a means of keeping their "long-haul" motor truck equipment moving at the work end of the journey which is always rough, soft or muddy.

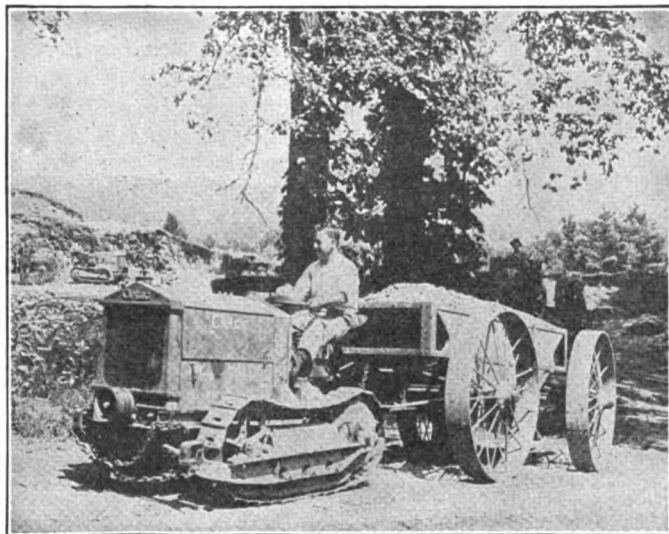
Road Building and Maintenance

On road work above all other applications the Cletrac justifies its use in fleets of 2 to 6 tractors. It is successfully replacing horses on breaker plows, drags, slip and wheel scrapers, scarifiers and graders and for hauling heavy material and machinery from one place to another along the job.

Because of its broad metal tracks, which reduce the weight per square inch and prevent slipping, the Cletrac can be used over unfinished parts of the roads that horses or trucks could not pull through.

It does as much work with 1 man in a day as is ordinarily done by 3 men and 3 teams. The economies are self-evident—particularly the saving in labor and feed which must be carried as a dead loss when the horses or mules are idle.

Ease of operation, economy and flexibility make the Cletrac equally useful for the maintenance of roads already built. Hundreds are now owned by municipalities, townships and counties for this work.



IDEAL POWER FOR ROAD WORK

In the Lumber Industry

Replacing Teams and Drivers—A Virginia logger reports the Cletrac replacing 6 mules and 3 drivers. For a Mississippi owner it replaces one 4-yoke ox team. An Ohio user says it does the work of 4 horses in most places. In Wisconsin a lumber company specializing in poles and ties have sold their 6 horses and now use 2 Cletracs instead. A Maine logger estimates the tractor will replace 6 horses. From Nova Scotia comes a statement that the tractor will replace 3 yoke of oxen or 4 1400-lb. horses.

Material Handled in a Day—The quantity of logs or lumber handled in a day by the Cletrac will of course vary greatly according to the operating conditions. In one location the tractor handles logs scaling 6600 ft. on a ¼-mile haul as an average day's work. In another it is moving from 9000 to 10,000 ft. per day. An Ohio furniture manufacturer reports 4000 ft. of logs as a day's work on a ½-mile haul. An eastern lumberman

states his tractor averages about 5000 ft. per day. A North Carolina lumber company states the Cletrac is hauling from 3500 to 9000 ft. of logs per day.



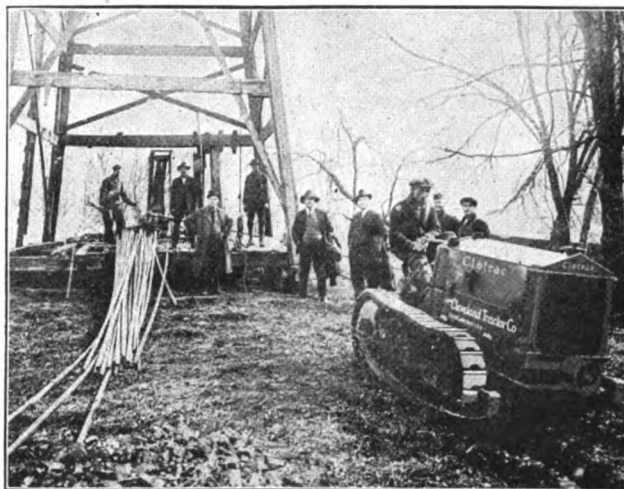
CLETRAC HAULING LUMBER

In the Oil Fields

The Cletrac's ability to go almost anywhere and take a good big load along with it is its greatest recommendation to oil men everywhere.

Roads are not essential when you have a Cletrac for it carries and lays down its own broad, metal tracks across country, over rough grounds, up mountain trails or through soft, wet stream beds.

The Cletrac supplies a complete haulage service capable of taking heavy machinery from the railway to the lease and from one job to another by the most direct route.



CLETRAC IN OIL FIELD WORK

Transportation Advisory Service

The Industrial Sales Department of THE CLEVELAND TRACTOR COMPANY has compiled and is constantly adding to a fund of facts and figures on haulage costs. These are taken from actual performance of the Cletrac under a wide range of conditions.

Shop men, yard managers, lumbermen, oil men and contractors are welcome, without cost or obligation, to any information that can be supplied. Address the Industrial Sales Department.

ESTABLISHED 1883

THE DUFF MANUFACTURING CO.

Lifting Jacks, Trench Braces and Drop Forgings

PITTSBURGH, PA.

NEW YORK, N. Y., 50 Church Street
HOUSTON, TEX., Southern Pacific Building

BRANCH OFFICES
CHICAGO, ILL., Peoples Gas Building
ST. LOUIS, MO., Railway Exchange

ATLANTA, GA., Candler Building
SAN FRANCISCO, CAL., Monadnock Building

Products

Manufacturers of DUFF LIFTING JACKS.
Also manufacturers of Trench Braces and Drop Forgings.

A Jack for Every Purpose

The Duff line comprises over 500 different styles, sizes and types, from the famous Duff Universal to the rugged, powerful, high speed, ball-bearings jacks of 75-ton capacity. Jacks furnished for use in upright, horizontal and inclined positions.



DUFF TRACK
JACK No. 1.

Duff Track Jacks

Recognized by the leading railroads of the world as a standard for track work, conforming strictly to the requirements of the Roadmasters' Association.

Jack No.	1	17	7
Capacity, tons	10	10	15
Height, in.	24	24	24
Raise, in.	13½	13¾	13¾
Weight, lbs.	65	70	87



DUFF AUTOMATIC
LOWERING JACK
No. 2

Duff Automatic Lowering Jacks

Built in a variety of sizes for general lifting purposes in shops and outdoors, mine cars, tractors, road making machines, steam shovels, agricultural machinery, narrow gauge track, etc.

Jack No.	50	51	2	4	219	339
Capacity, tons	5	5	10	15	15	15
Height, in.	16	21	21	22	28	22
Raise, in.	8	13	10	10	17½	11½
Weight, lbs.	35	42	73	106	98	87



DUFF JOURNAL BOX
JACK No. 259

Duff Journal Box Jacks

These jacks combine unusually light weight with ample strength for their rated capacity. A special feature is the positive safety forged steel top, eliminating danger of pushing top of jack out of base.

Jack No.	111	2511	3509	3511
Capacity, tons	20	25	35	35
Height, in.	10	11	9	11
Raise, in.	5	5¾	3¾	5¾
Weight, lbs.	28	38	50	55



TRADE-MARK

Duff Truck Jacks

Unparalleled in convenience and ease of operation. Furnished as standard equipment on leading trucks of America. Also recommended for garage use. Are sturdy and dependable in severe and constant service.

Jack No.	100	200
Capacity, tons	3	5
Height, in.	10¾	13
Raise, in.	5¾	6¾
Weight, lbs.	16	28



DUFF TRUCK
JACK No. 100



DUFF BALL
BEARING JACK
No. 66

Duff Standard Ball Bearing Screw Jacks

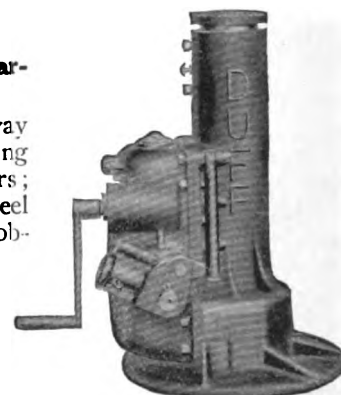
Heavy duty general service jacks of easy leverage and rapid in action. Suitable for work in repair shops, yards and for general lifting purposes. Constructed along the most advanced lines.

Jack No.	66	60	67	61	68	62
Capacity, tons	15	15	25	25	35	35
Height, in.	22	26	22	27	22	26
Raise, in.	10	13	10	13	10	13
Weight, lbs.	120	132	167	196	220	250

Duff High Speed Ball Bearing Screw Jacks

Widely used in railway shops and yards for raising heavy locomotives and cars; also for lifting bridges, steel tanks and other heavy objects.

Jack No.	7526	5026	5020
Capacity, tons	75	50	50
Height, in.	26	26	20
Raise, in.	12	14	8
Weight, lbs.	440	320	300



DUFF HIGH SPEED
JACK No. 5036

Further Information

The Duff jacks illustrated show only the most commonly used sizes and types. We will gladly recommend style best suited for the requirements, if not covered above. For general description of Duff jacks send for catalogue.

IMPROVED OFFICE PARTITION CO.

Manufacturers of the Telescoping, Sectional, Portable Partition

TELEPHONE
NEWTOWN 3400, 3401

Grand Street
ELMHURST, NEW YORK, N. Y.

Product

"TELESCOPARTITION" (patented), a TELESCOPING, INTERCHANGEABLE, PORTABLE OFFICE PARTITION for subdividing.



for erection, and the partition is constructed to be moved over and over again, without damage.

Advantages

The sectional and telescoping features of this product make it possible to rearrange the partition whenever necessary, without any waste of material. The first cost of "Telescopartition" does not exceed that of a non-portable partition. "Telescopartition" represents an asset—not expense.

Description

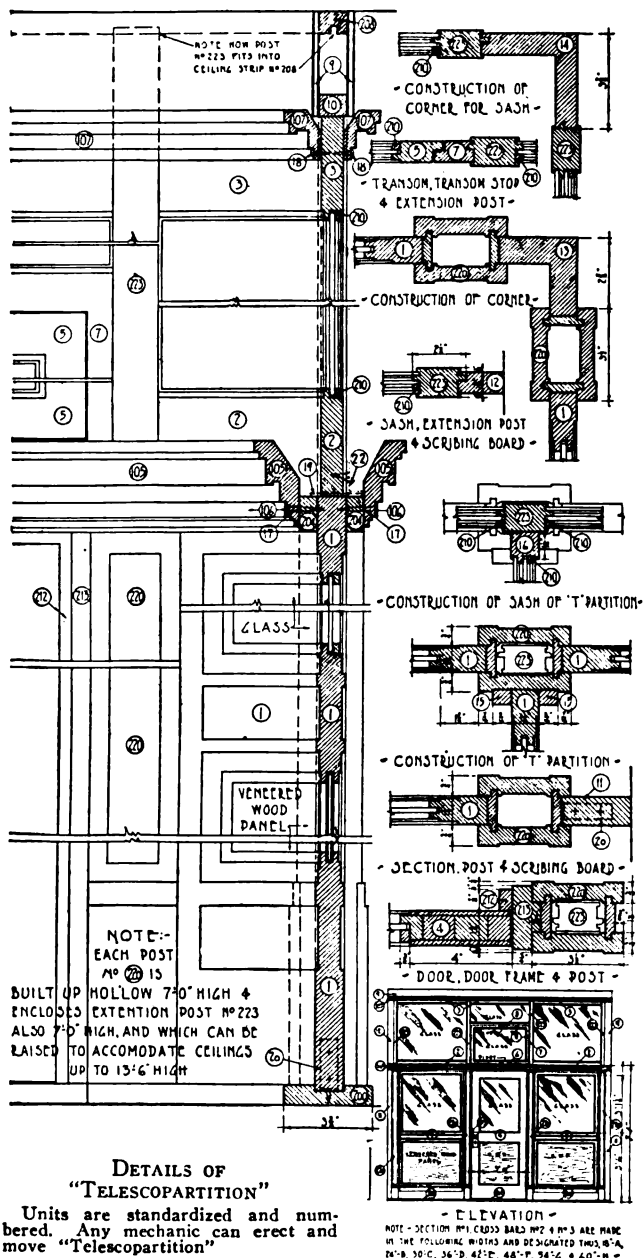
A sectional partition, carried in stock 7 ft. high, and to ceiling, in plain oak, quartered oak and birch. Also furnished in mahogany, American walnut and hollow steel. Posts are 7 ft. long, built up hollow, and enclose a 7-ft. telescoping extension member to fit ceilings up to 13 ft. 6 in. For higher ceilings, longer members are supplied. Section units are made of different widths to fit all layouts. Screws only are used

How Shipped

"Telescopartition" is shipped knocked down, in the white or finished, without glass, including hardware, Russell & Erwin make, crated. Quotations also given for complete erection.

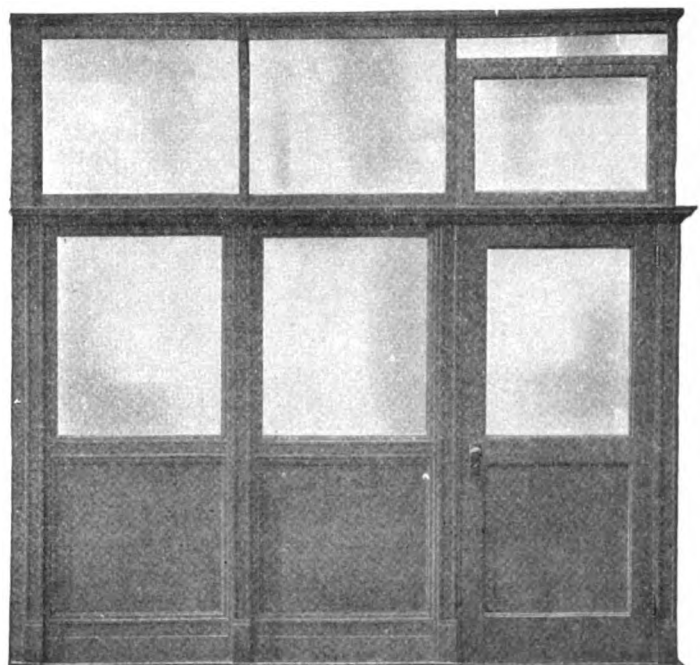
Installations and References

Baldwin Piano Company, Cincinnati, Ohio
Buick Motor Car Company, Detroit, Mich.
Dunlop Tire & Rubber Company, Buffalo, N. Y.
Erie Railroad Company, New York, N. Y.
General Motors Company, Pontiac, Mich.
Goodyear Tire & Rubber Company, Akron, Ohio
New York Central Railroad, New York, N. Y.
Oakland Motor Car Company, Pontiac, Mich.
Standard Oil Company, New York, N. Y.
Timken Roller Bearing Company, Detroit, Mich.
Traveler's Insurance Company, Hartford, Conn.
United States Rubber Company, Detroit, Mich.
Westinghouse Lamp Company, New Jersey
Wilson Body Company, Detroit, Mich.
Austin & Company
DuPont Engineering Company
Lockwood, Green & Company
Dwight P. Robinson & Company



DETAILS OF "TELESCOPARTITION"

Units are standardized and numbered. Any mechanic can erect and move "Telescopartition"



"TELESCOPARTITION"

THE E. F. HAUSERMAN COMPANY

Unitbilt Steel Office and Industrial Partitions

1729 East 22nd Street
CLEVELAND, OHIO

BRANCH OFFICES

NEW YORK, N. Y., 41 East 42nd Street

PITTSBURGH, PA., Oliver Building

DETROIT, MICH., Penobscot Building

Products

HAUSERMAN-SYSTEM OFFICE PARTITIONS and RAILINGS; HAUSERMAN-SYSTEM INDUSTRIAL PARTITIONS. (Unitbilt Steel Construction.)

General Steel Sash Glazing and Erection Contractors.

For Hauserman-System Skylights, see pages 216-217; for Hauserman-System Toilet Partitions, see page 271; for Hauserman-System Shelving, see pages 916-917.

Service

Hauserman-System partitions are *designed, built and installed* with a view to economy, interchangeability and effective office and shop layout. The Hauserman-System, "Organized for Service," extends from a thorough study of requirements to the final installation.

Hauserman-System Partitions

Partitions consist of standardized interchangeable units, easily erected, taken down and re-erected. They combine moderate cost with rugged strength, clean-cut appearance, extreme flexibility and continuous utility. Furnished in baked-on olive green or gray enamel, with a prime coat which will take any finish, they are so neat and trim in appearance as to be appropriate for executive offices in high grade commercial and factory buildings, and so strong and rigid that they meet every demand of rough factory usage.

Hauserman-System partitions are designed and built to meet all types of conditions. If desired to extend the partition to the ceiling where columns, beams or steam pipes interfere, special patented top conditions are

available, insuring a perfect fit. The same is true for end conditions where the partitions are joined to walls. The Hauserman-System is unique in this regard.

Base and post conduits for the distribution of electric, telephone and telegraph wires, special base boards, carpet strips and moulding, as desired. The entire partition has the same appearance on both sides.

Hauserman-System partitions cost little more than the cheaper forms of steel, wood, plaster, gypsum, and combination types of partitions. With Hauserman-System partitions the first cost is practically the only cost. Rearrangements, utilizing every unit may be made as often as desired with practically no expense except for labor.

The single door (H2D) is interchangeable with 2-light wide panels, and in like manner any number of panels are interchangeable with any other number where total number of lights in width is the same.

Hauserman-System partitions are 100% usable, 100% salvageable, 100% complete.

Soundproofness—For executive offices special soundproof partitions have been developed. Prices on application.

Installation—Hauserman-System partitions are sold preferably on the basis of a complete installation. Hauserman workmen, employed continuously in erecting and glazing Hauserman-System products, acquire experience and speed which enable them to erect the job more satisfactorily and at less cost than is possible with inexperienced men.

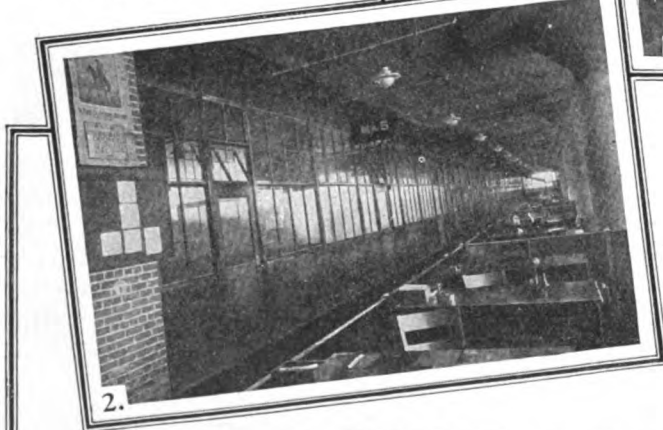
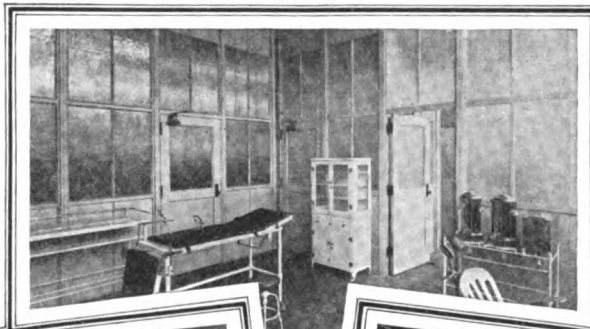
Hauserman-System partitions, erected and glazed complete, insure maximum satisfaction with minimum expense.

1. The Foote-Burt Co., Cleveland
George S. Rider Co. Engineers

2. Studebaker Factory, Detroit
Albert Kahn, Architect
A. J. Smith Const. Co., Contractor
Typical long run of partitions and railings.

Boldt Construction Co., Contractors
Factory hospital. Gray field painting.

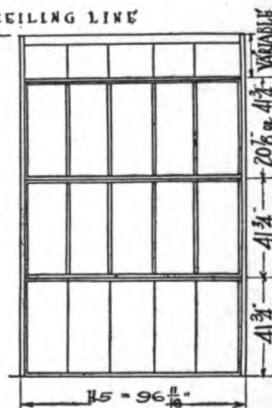
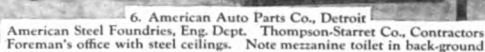
3. Famous Players—Lasky Corp.
Cleveland
L. F. Johnson, Engineer for owners
Showing cashier's cage, executive office and railings.



THE E. F. HAUSERMAN CO.
CLEVELAND OHIO

...TYPICAL INSTALLATIONS...
...UNITBILT PARTITIONS...

"ORGANIZED FOR SERVICE"



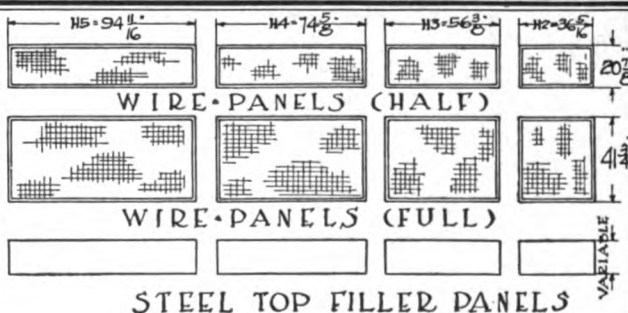
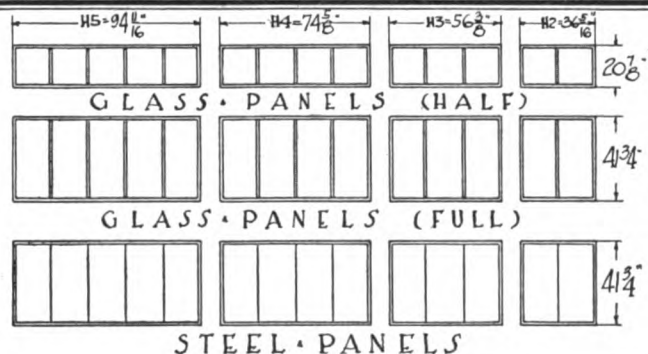
*** EXPLANATORY * REMARKS ***

* SINGLE SWING DOOR IN H2 UNIT ** * SINGLE SLIDE DOOR IN H3 UNIT ** *** DOUBLE SWING OR SINGLE SLIDE IN H4 UNIT *

* SINGLE SLIDE DOOR IN H5 UNIT ** * DOUBLE SLIDE DOOR IN TWO H3 UNITS ** *** DOOR HEIGHTS ARE 81 1/4" - 102 1/8" AND 123" *

* TWO HALF PANELS (20 1/2") TOTAL ONE FULL PANEL (41") IN HEIGHT *** TOP FILLER PANEL IS VARIABLE *** ADD 2 1/2" TO PANEL HEIGHT FOR * CORNICE ***

“ELEVATIONS OF TYPICAL UNITBILT PARTITION UNITS”



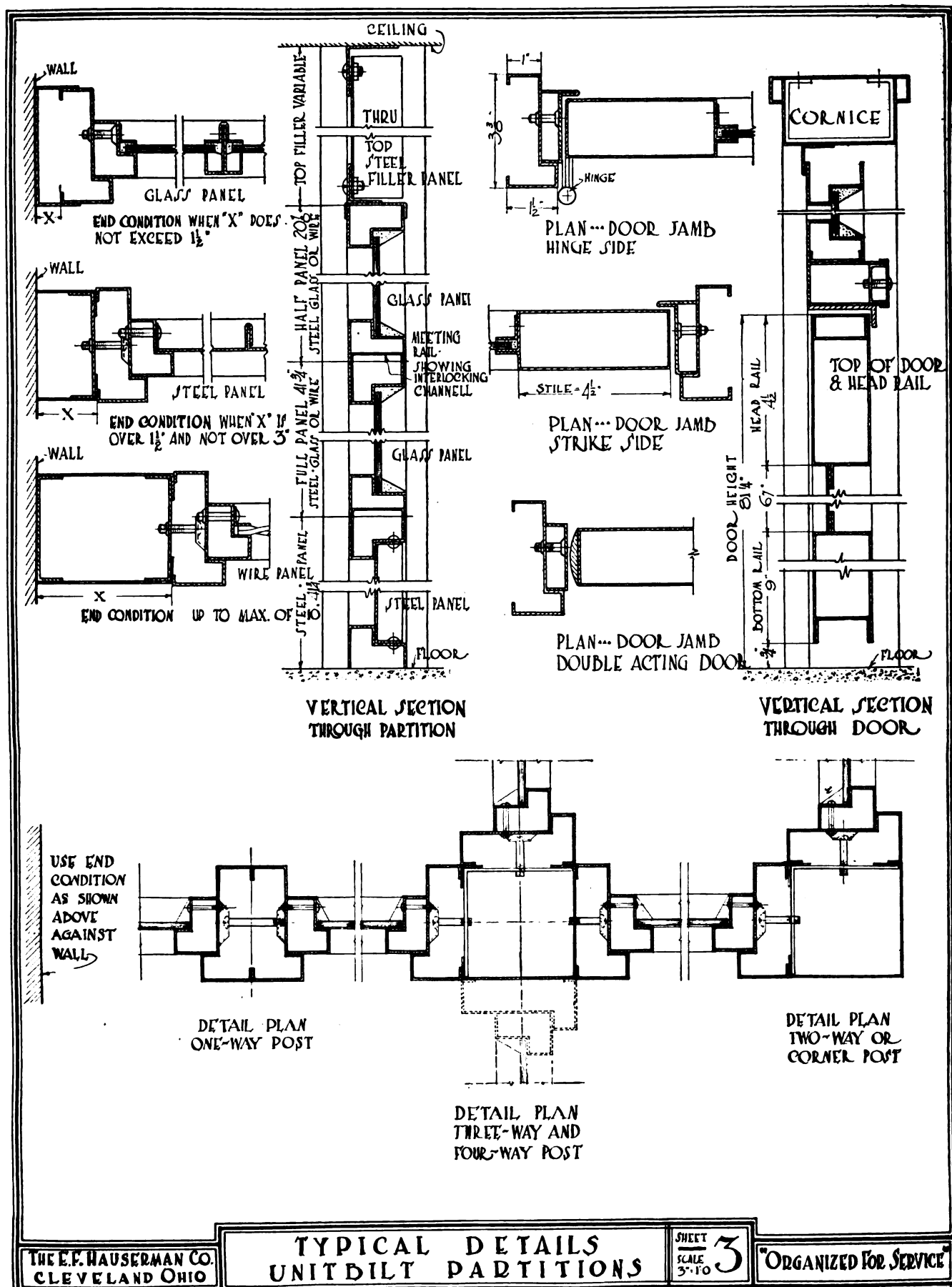
STEEL TOP FILLER PANELS

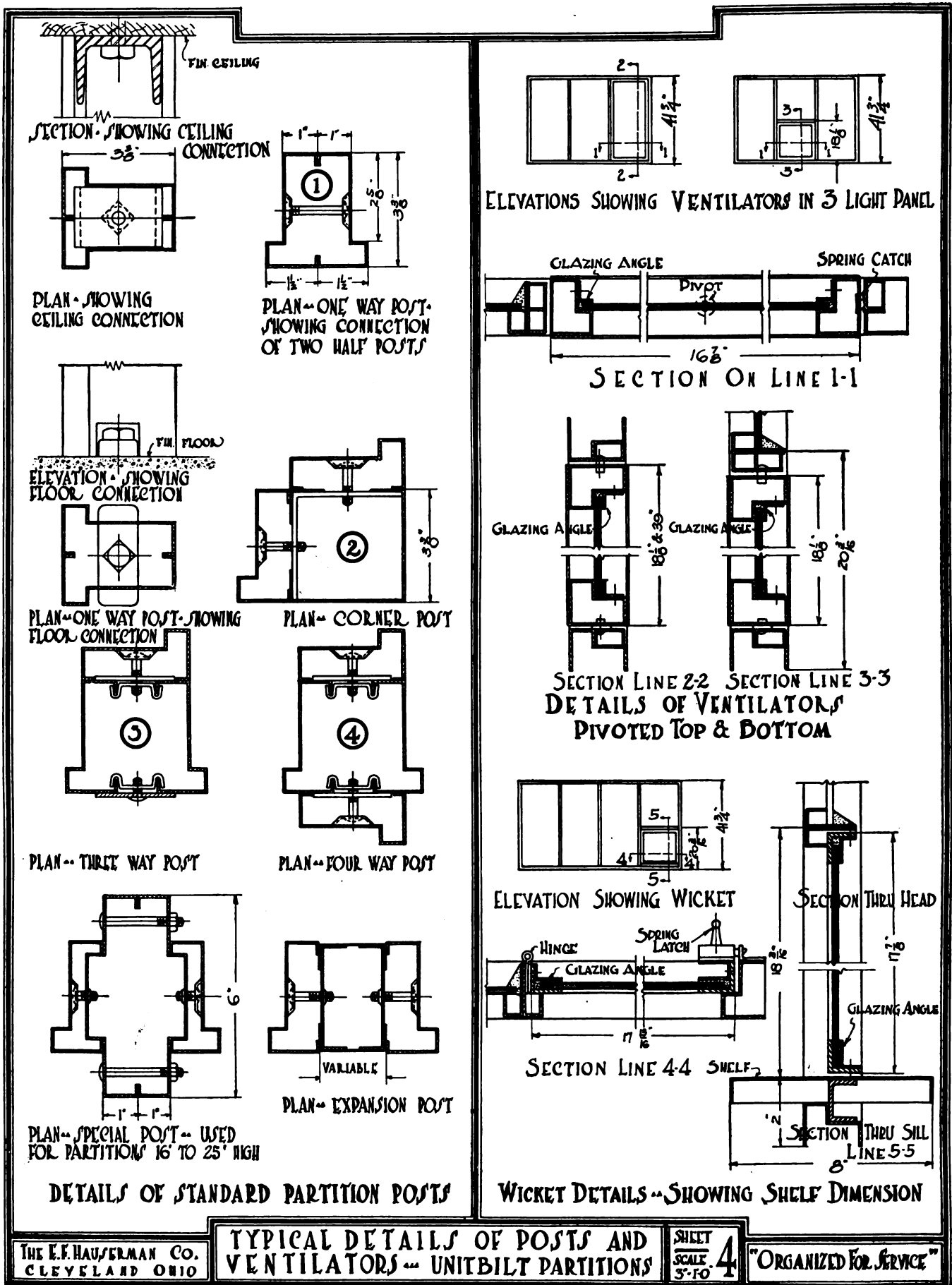
THE E. F. HAUSERMAN CO.
CLEVELAND OHIO

• ELEVATIONS • SIZES •
ARRANGEMENT • UNIT BILT • PARTITIONS •

SHEET
—
SCALE
 $\frac{1}{8}" = 1'-0"$ 2

"ORGANIZED FOR SERVICE"





FEDERAL STEEL FIXTURE COMPANY

TELEPHONE
CENTRAL 1574

CHICAGO, ILL.

CHICAGO OFFICE, 611 Wrigley Building
DETROIT OFFICE, 913 Dime Bank Building
NEW YORK OFFICE, 706 Park Row Building

MINNEAPOLIS OFFICE, 609 Fifth Avenue,
South
CLEVELAND OFFICE, 403 Marion Building

Products

FEDERAL STEEL LOCKERS, STEEL SHELVING AND RACKS.

Also manufacturers of Bench Legs, Blue Print Cabinets, Boxes, Bins, Filing Cabinets, Metal Furniture, Hospital Equipment.

Federal Unit Steel Lockers

Simple in design, with all parts thoroughly standardized, interchangeable and uniform. The welded angle steel frame and special overlap door absolutely guarantee against door troubles. The Federal locker has fewer parts, erects more easily and is clean cut, handsome and strong.

Specifications—Doors—Full pickled, cold rolled furniture steel, No. 16 U. S. gauge (.0625 in. thick) if 15 in. wide by 72 in. high or larger; smaller sizes No. 18 U. S. gauge (.05 in. thick). Doors shall have reinforcing panels of hard steel angle bars ($\frac{1}{4} \times \frac{3}{4} \times \frac{1}{2}$ in.) riveted or welded to reverse side. Doors shall overlap locker frame and allow $\frac{1}{2}$ -in. clearance between door panel and locker frame to prevent binding.

Frames—Front frames shall be of hard angle steel ($1 \times 1 \times \frac{1}{8}$ in.) assembled by oxy-acetylene weld. They shall be unit in principle to give absolute squareness and rigidity and allow for rearrangement of lockers.

Body—Locker body shall be pickled and cold rolled steel No. 22 U. S. gauge (.0312 in. thick). Single row lockers shall have angle steel framed backs ($\frac{1}{4} \times \frac{3}{4} \times \frac{1}{2}$ in.) for each second unit. All parts shall be properly flanged or braced to give uniform strength.



Tops—Tops shall be inserted below top cross angles at front and back and shall overlap adjoining top 1 in. Slant tops shall have 6-in. pitch with $\frac{1}{4}$ -in. eave at front.

Bottoms—Bottoms shall be flush and supported by $1 \times 1 \times \frac{1}{8}$ -in. angle reinforcement.

Shelves—Shelves shall be 9 in. below top. They shall be flanged on all sides with double $\frac{1}{2}$ -in. smooth edged flange at front.

Locking Device—Locking device shall be 3-point, operating with quarter turn of handle to engage locker frame immediately opposite lock and on top and bottom cross bars. Locking bars shall be $\frac{1}{2}$ in. by No. 10 gauge stock. Door handles shall be provided with loop for padlock. (Quote extra for Eagle, Miller or Yale R381 $\frac{1}{2}$ master-keyed locks with 2 keys each, or Miller 3332 B combination lock.)

Hinges—Hinges shall be $2\frac{1}{2}$ -in. fixed pin heavy steel butts with concealed flanges. 72-in. doors shall have 3 hinges, smaller doors 2 hinges.

Hooks—Hooks shall have sherardized, rustless finish. Locker backs shall have 2-prong hook for coat and hat. Sizes 15 in. or less shall have a single prong hook attached with 2 bolts. Larger sizes shall have special 2-prong hooks with $\frac{3}{8}$ -in. steel rod for coat hanger on 60-in. or 72-in. sizes.

Legs—All front legs shall have a simple screw adjustment (to allow for any unevenness in floor). Back legs in single row locker sections shall be of $\frac{3}{4}$ -in. angle steel and shall be integral part of locker frame.

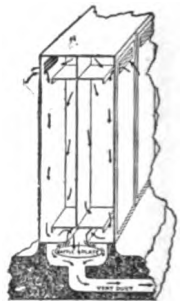
Ventilation—Doors shall have embossed, hooded or louver ventilators. They shall be 7 in. long and 1 in. apart on centers with $\frac{1}{4}$ -in. opening at lower edge. There shall be nine embossings near top and also near bottom.

Numbers—Lockers shall be numbered with black figures $\frac{3}{4}$ -in. high sunk in polished brass plates near top of door.

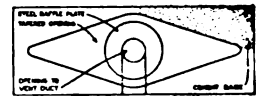
Finish—Two-coat olive green or pigment black enamel baked at a temperature of 300° Fahr.

Standard Sizes—Any combination of dimensions as listed:
12 in. wide, 12 in. deep, 36 in. high, on 6-in. legs
15 in. wide, 15 in. deep, 42 in. high, on 6-in. legs
18 in. wide, 18 in. deep, 48 in. high, on 6-in. legs
60 in. high, on 6-in. legs
72 in. high, on 6-in. legs

Note: 36-in. and 42-in. sizes made 2 lockers high.



SECTION OF FEDERAL VENTILATED LOCKERS



PLAN OF CEMENT BASE FOR VENTILATED LOCKERS



Section of Door and Locker Frame



Key Lock



Time Lock



Adjustable Leg



Regular Door Handle



Side Hook



Ceiling Hook



Handle with Padlock Loop



Coat Rod Hook

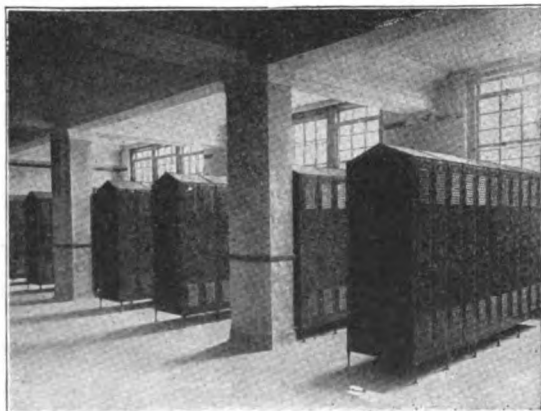


Back Hook

PARTS OF FEDERAL UNIT STEEL LOCKERS



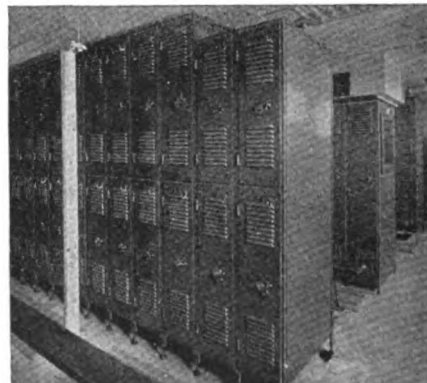
SINGLE TIER LOCKER



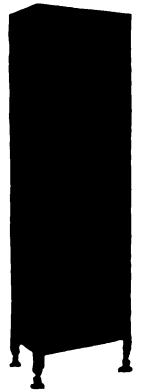
FEDERAL LOCKERS, SINGLE TIER WITH SLANT TOPS



DOUBLE TIER LOCKER



FEDERAL LOCKERS, DOUBLE TIER WITH SINGLE AND DOUBLE TIER IN BACKGROUND



FEDERAL EXPANDED METAL LOCKERS

Federal Steel Shelving and Racks

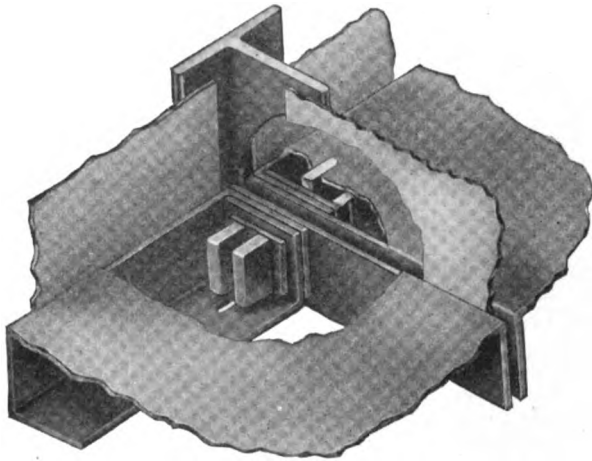
Simple in design, with all parts thoroughly standardized, interchangeable and uniform. The patented shelf formation and patented shelf adjustment give 32% more load capacity, and make adjustment actually possible, practical and probable.

Standardization—We use but one type of construction. From the open rack (tee verticals and shelves) to the entire equipment—including closed sides, backs, bin fronts, shelf dividers, box dividers, and stops, doors either hinged or sliding, ledge panels, ledge shelves, etc.—there is not a single item of parts that must be substituted or discarded.

Adjustability, Time and Labor Saving—The shelf attaches with a hammer blow and is released for re-adjustment in a similar way.

This very simplicity economizes time, by enabling the storekeeper to provide shelf spaces of convenient size—near, handy and get-at-able.

Special Service—The Engineering Department is ready at all times to co-operate in designing and planning equipment to carry loads and economically handle and store the parts.



PHANTOM VIEW FEDERAL STEEL SHELVING

Rear vertical intersection, showing how shelf flanges are formed and interlocked

Specifications—General—All parts shall be uniform and interchangeable. Each part shall adjust independently. The steel shall be a special rerolled stock which shall be stretched into shape so that all surfaces shall be flat, smooth and square. There shall be no raw cutting edges. Double row sections shall be such that they may be separated and used in single row arrangement.

Uprights—The vertical load shall be carried by $1\frac{1}{2} \times 1\frac{1}{2} \times \frac{1}{8}$ -in. hard steel T-bars, which shall provide for 3-in. [optional $1\frac{1}{2}$ -in.] vertical shelf adjustment (closed uprights shall include No. 20 U. S. gauge [.0375 in. thick] cold rolled sheet steel).

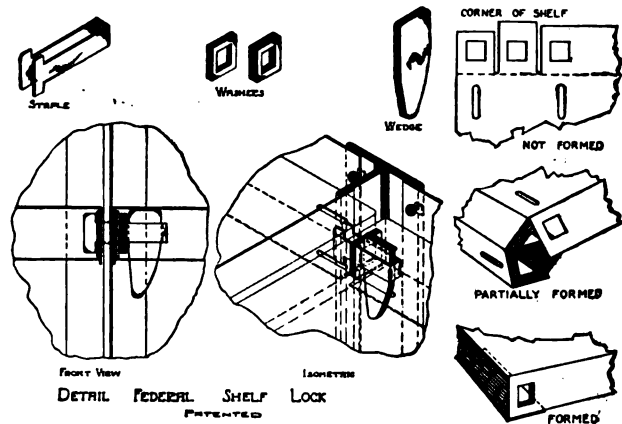
Shelves—Shelves shall be of No. 18 U. S. gauge (.05 in. thick) cold rolled flat steel properly reinforced to support 150 lbs. per sq. ft. of shelf [optional—specify maximum safe load required].

Backs—Closed backs shall be of No. 20 U. S. gauge (.0375 in. thick) cold rolled steel and shall attach so that they may be added or removed without moving rack sections.

Bin Fronts—Bin fronts shall be of No. 18 U. S. gauge (.05 in. thick) cold rolled steel. They shall overlap and engage the shelf or the bin front immediately below.

Shelf Dividers—The shelf or compartment dividers shall be of No. 20 U. S. gauge (.0375 in. thick) cold rolled steel. They shall have $\frac{1}{4}$ -in. vertical beads and shall attach through the shelf with no raw flanges exposed.

Enamel Finish—The entire shelving shall have an olive green [optional—pigment black] baked enamel finish which shall be applied after machining is completed and to surfaces thoroughly clean and free from rust.



FEDERAL SHELF LOCK AND SHELF CORNER CONSTRUCTION, PATENTED

STANDARD SIZES FEDERAL SHELVING PARTS DIMENSIONS IN INCHES

PART NO. 1. UPRIGHT PARTITIONS
Heights. 48-54-60-66-72-78-84-90-
96-102-108-114-120-126-
132-144-156-168
Depths. 9-12-15-18-24-30-36

PART NO. 11. SKELETON UPRIGHTS
Same as Upright Partitions

PART NO. 2. SHELVES
Widths. 18-24-30-36-42-48
Depths. 9-12-15-18-24-30-36

PART NO. 3. BACKS
Heights. Same as Upright Partitions
Widths. 18-24-30-36-42-48

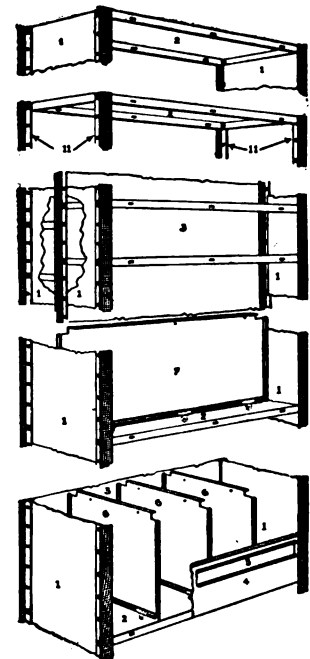
PART NO. 4. BIN FRONTS
Heights. 2-3-4-5-6-8
Widths. 18-24-30-36-42-48

PART NO. 5. LABEL HOLDERS
Heights. $\frac{1}{8}$ - $1\frac{1}{8}$
Widths. 18-24-30-36-42-48

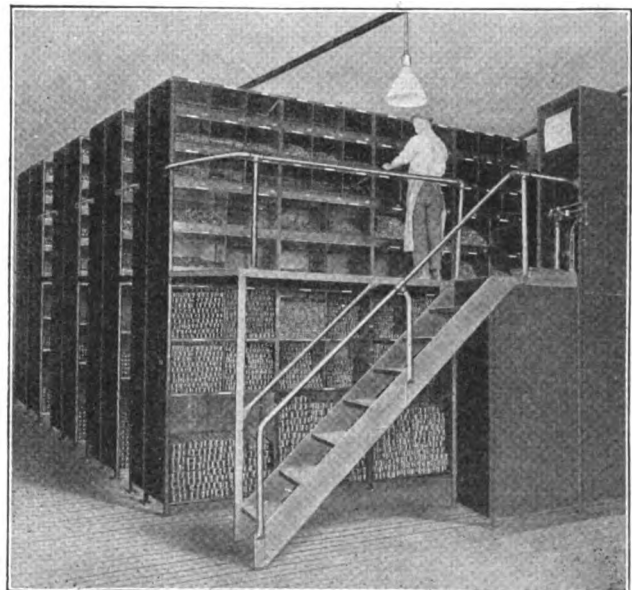
PART NO. 6. SHELF DIVIDERS, CROSSWISE
Heights. 6-9-12-15-18-21-24
Depths. 9-12-15-18-24-30-36

PART NO. 7. SHELF DIVIDERS, LENGTHWISE
Heights. 5-8-11-14-17-20-23
Widths. 18-24-30-36-42-48

PART NO. 8. LEDGE SHELVES
Widths. 18-24-30-36-42-48
Depths. 12-15-18-24



CONSTRUCTIONAL VIEWS
FEDERAL STEEL SHELVING



FEDERAL STEEL SHELVING, MEZZANINE FLOOR AND STAIRWAY
DIAMOND CHAIN AND MFG. CO., INDIANAPOLIS, IND.

THE HART & HUTCHINSON COMPANY

Steel Lockers

NEW BRITAIN, CONN.

BRANCH OFFICES

BOSTON, MASS., 654 Oliver Building
CHICAGO, ILL., 73 East Lake Street

NEW YORK, N. Y., 9 East 40th Street
PHILADELPHIA, PA., Real Estate Trust Building

Products

STEEL LOCKERS; STEEL SHELVING.
Also Steel "Storall" Cabinets.

Standard Lockers

Metal—All sheet metal used is best grade cold rolled U. S. standard gage, free from scale and buckle. Partitions (intermediate sides and ends), tops, shelves and bottoms, No. 21 gage. Backs, No. 20 gage. Door frames and doors, No. 14 gage.

Door Frames and Backs—Made from one sheet each, flanged 1-in. on both edges, formed at bottom to provide 6-in. legs.

Sides—Securely bolted to door frame and back.

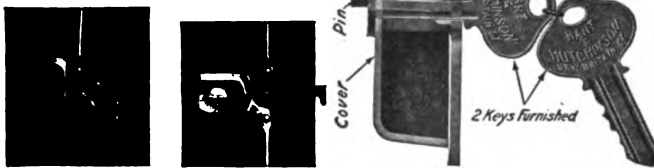
Top Member—Projects over and locks on to front frame, giving a finish. Flat top is standard.

Bottoms—Formed without ledges so they can be brushed out easily.

Locking Device—Operated by rustproof T-handle, engages door frame at 3 points. So arranged that manipulation of latch is impossible when thrown.

Doors—Type "B-C," 6-louvered openings top and bottom; one piece with steel channel reinforcing; hung to door frame with three 2-in. fast pin butts.

Type "A-C," same as "B-C," except panels are perforated with $\frac{5}{8}$ -in. square holes on 1-in. centers.



Unlocked Position Locked Position
BACK OF DOOR SHOWING
LOCK COVER
 $\frac{1}{2}$ SIZE OF LOCKS, SHOWING
DETAILS

SIZES AND SHIPPING WEIGHTS STANDARD LOCKERS

Single Tier				Double Tier			
Dimen- sions, in.	Wt., lbs.	Dimen- sions, in.	Wt., lbs.	Dimen- sions, in.	Wt., lbs.	Dimen- sions, in.	Wt., lbs.
W D H		W D H		W D H		W D H	
12x12x60	65	12x12x72	75	12x12x36	35	12x12x48	50
12x15x60	70	12x15x72	80	12x15x36	40	12x15x48	55
12x18x60	75	12x18x72	85	15x12x36	45	15x12x48	60
15x12x60	70	15x12x72	85	15x15x36	50	15x15x48	65
15x15x60	75	15x15x72	90	15x18x36	55	15x18x48	70
15x18x60	80	15x18x72	95	In double tier style each com- partment consti- tutes a locker.			
18x15x60	80	18x15x72	95				
18x18x60	85	18x18x72	100				
18x24x60	95	18x24x72	115				
24x18x60	100	24x18x72	125				
24x24x60	110	24x24x72	135	15x18x42	60		

Tabulated sizes are carried in stock for prompt shipment.

Equipment—All standard lockers have a solid brass, pin tumbler, paracentric master-keyed lock, with 2 keys to each lock; 5000 changes.

Each locker has suitable number of 2-prong rustproof hooks of ramshorn design, a towel or coat hanger rod and a solid brass number plate with $\frac{1}{2}$ -in. numerals etched in black.

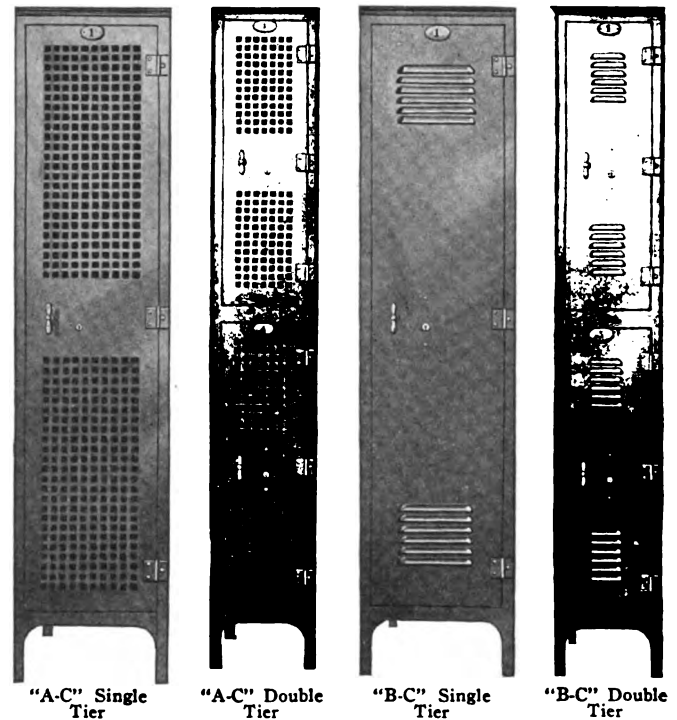
Single tier lockers have hat shelf 3 in. below top with rounded front edge.

No shelf in double tier.

Optional Equipment—21° angle sloping tops. Combination and keyless locks or padlock attachment. Extra shelves for storage.

Finish—Standard olive green or black. Special finishes are produced to suit requirements.

Shipped—Knocked down flat, with assembling instructions, or shipped erected and crated, or erected in place by an efficient corps of trained mechanics.



REPRESENTATIVE UNITS, "H & H" STEEL LOCKERS
Furnished in sections of any number of units. Details on following page

Standard Universal Unit Shelving

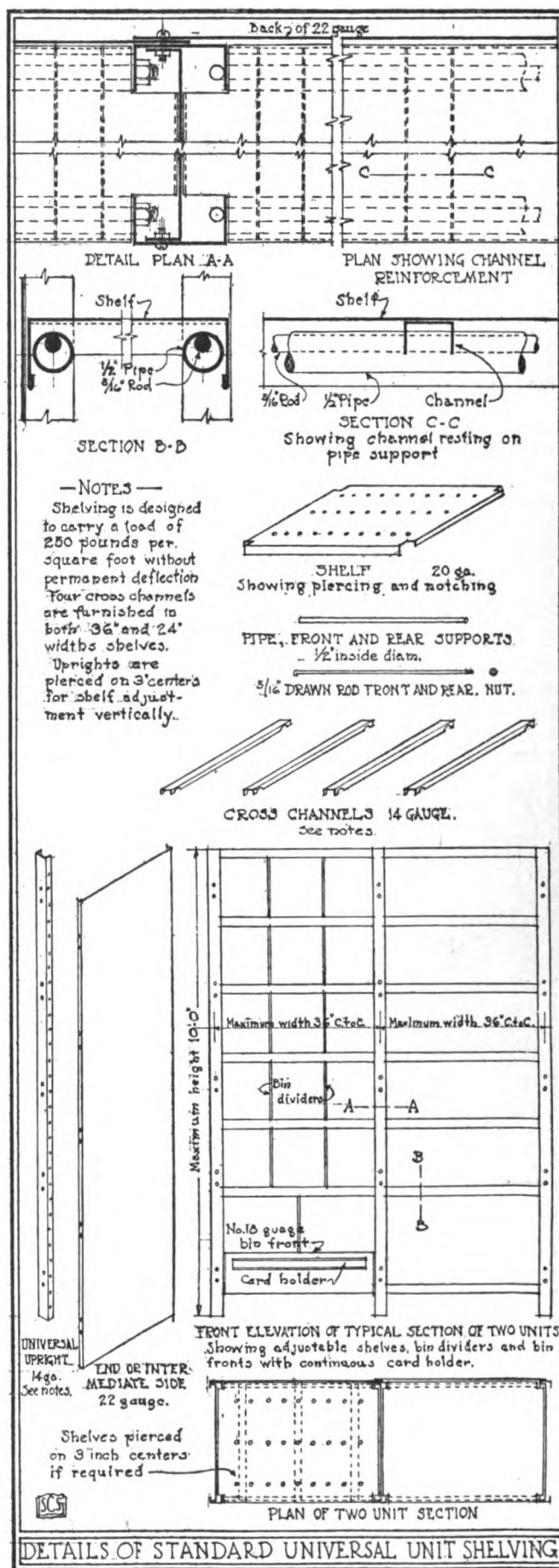
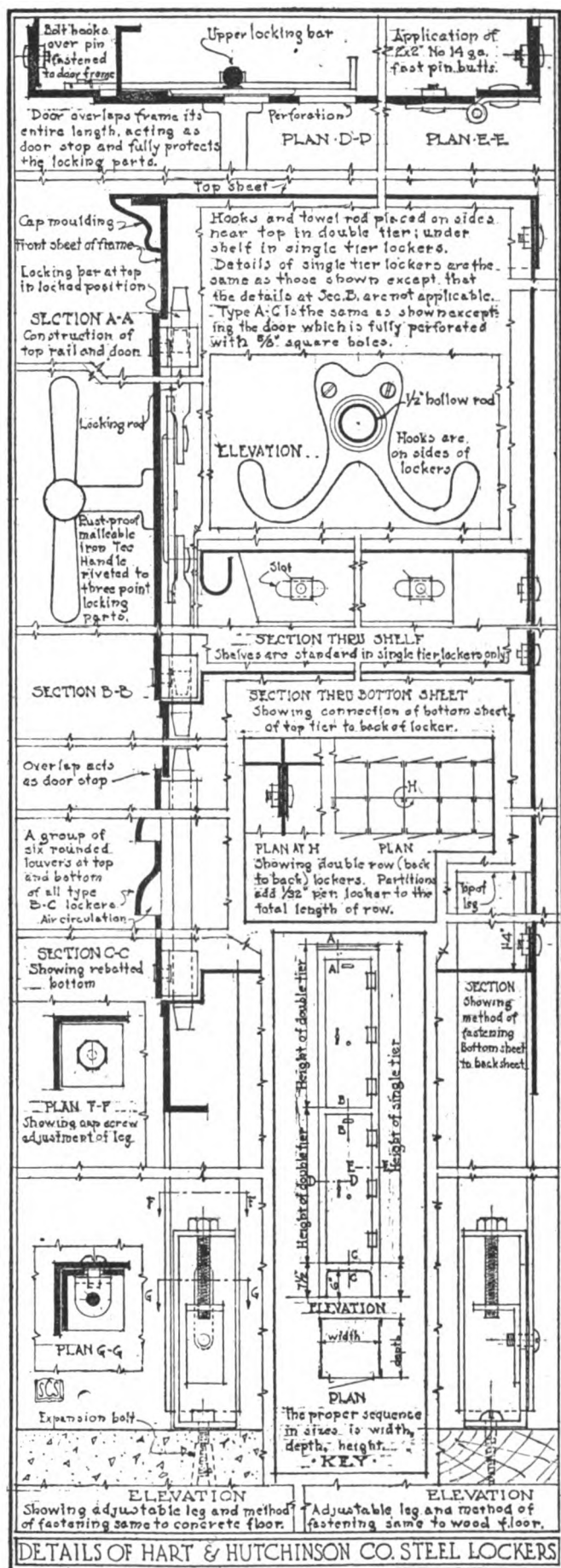
A standard unit type of steel shelving built on the "mill construction" principle. Substantial channel uprights are bolted together by rods incased in pipe separators and on these rest channel cross supports (or girders) that carry the loads imposed on the shelves. The load is not carried by the shelf but by the structural members under it.

Each section is a separate unit with ends and back; and dividers, bin fronts, card holders, etc., are furnished to suit the desired conditions.

Made in heavy and light weight.

Dimensions—Shelves are 24 in. wide by 12 in. deep; 27 by 15 in., 30 by 18 in., 33 by 21 in., 36 by 24 in.

Uprights are from 60 to 120 in. in length. Vertical adjustment on 3-in. centers.



THE E. F. HAUSERMAN COMPANY

Unitbilt Steel Shelving

1729 East 22nd Street
CLEVELAND, OHIO

BRANCH OFFICES

NEW YORK, N. Y., 41 East 42nd Street

PITTSBURGH, PA., Oliver Building

DETROIT, MICH., Penobscot Building

Products

HAUSERMAN-SYSTEM SHELVING. (Unitbilt Steel Construction.)

Designers, manufacturers and erectors of complete Shelving Installations.

For Hauserman-System Skylights, see pages 216-217; for Hauserman-System Toilet Partitions, see page 271; for Hauserman-System Industrial Partitions, see pages 908-911.

Service

The Hauserman-System, "Organized for Service," comprises a complete understanding of storage problems, including the design and installation of shelving to meet specific conditions.

Hauserman-System Shelving

Hauserman-System shelving consists of standardized adjustable steel uprights, shelves, backs, dividers and supplementary parts, securely bolted together to give maximum strength and flexibility. Tests have shown this to be the strongest shelving on the market.

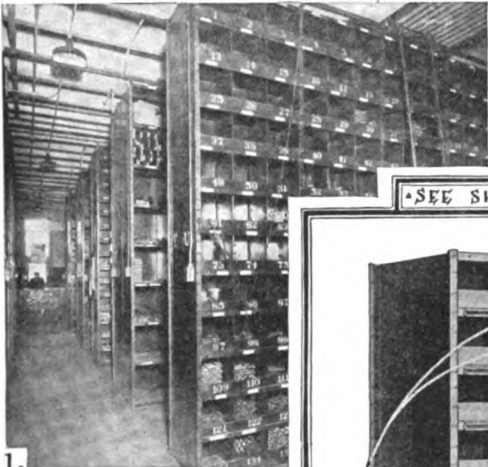
Description—Uprights are built in two parts, including a tee upright with a heavy formed head to withstand shocks and a long stem for ease in making connections, and a flanged upright which connects the tee uprights. Shelves are of sheet steel, with double

folded flanges and are rigidly connected to the uprights. Dividers of sheet steel, with double thickness or beaded edges. Backs, bin fronts, label holders and other parts of specially designed sheet steel.


Assembly—Each shelf is joined to tee uprights at each corner with two bolts, making a 9-bolt tie. Intermediate uprights and backs, bolted to the tee uprights, tie the whole assembly firmly to make a rigid unit of storage equipment strong enough to carry, by actual test, a load of 11 tons for each two uprights. The use of bolts is the one method of making positive and permanent connection permitting reassembly.

Hauserman-System shelving is built with 3-in. adjustments vertically and horizontally to meet changing storage requirements. By inverting the shelf, the vertical flange serves as a bin front. 3-in bin fronts in multiples form deeper bins. Label holders can be attached to front of shelves. Doors with handle or lock can enclose any desired compartments. Boxes can be furnished with slots in sides to permit any arrangement of dividers on 1-in. adjustments. Special tool cabinets, tables, waste bins, milling cutter holders, desks, etc., can be furnished.

The Engineering Department will furnish layouts to meet special requirements of a given installation.

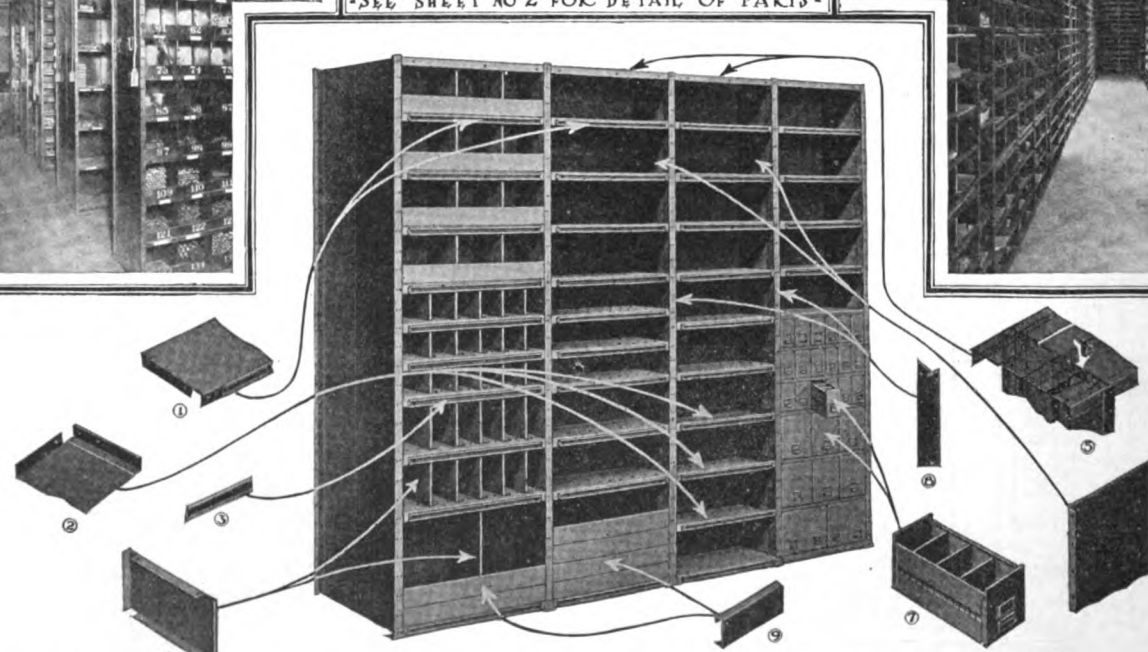


1. View in railroad storehouse equipped with Hauserman Unitbilt Shelving. Note track and ladder.



2. Section of Hauserman Shelving installation, Cleveland Office. Famous Players Lasky Corporation.

SEE SHEET NO 2 FOR DETAIL OF PARTS

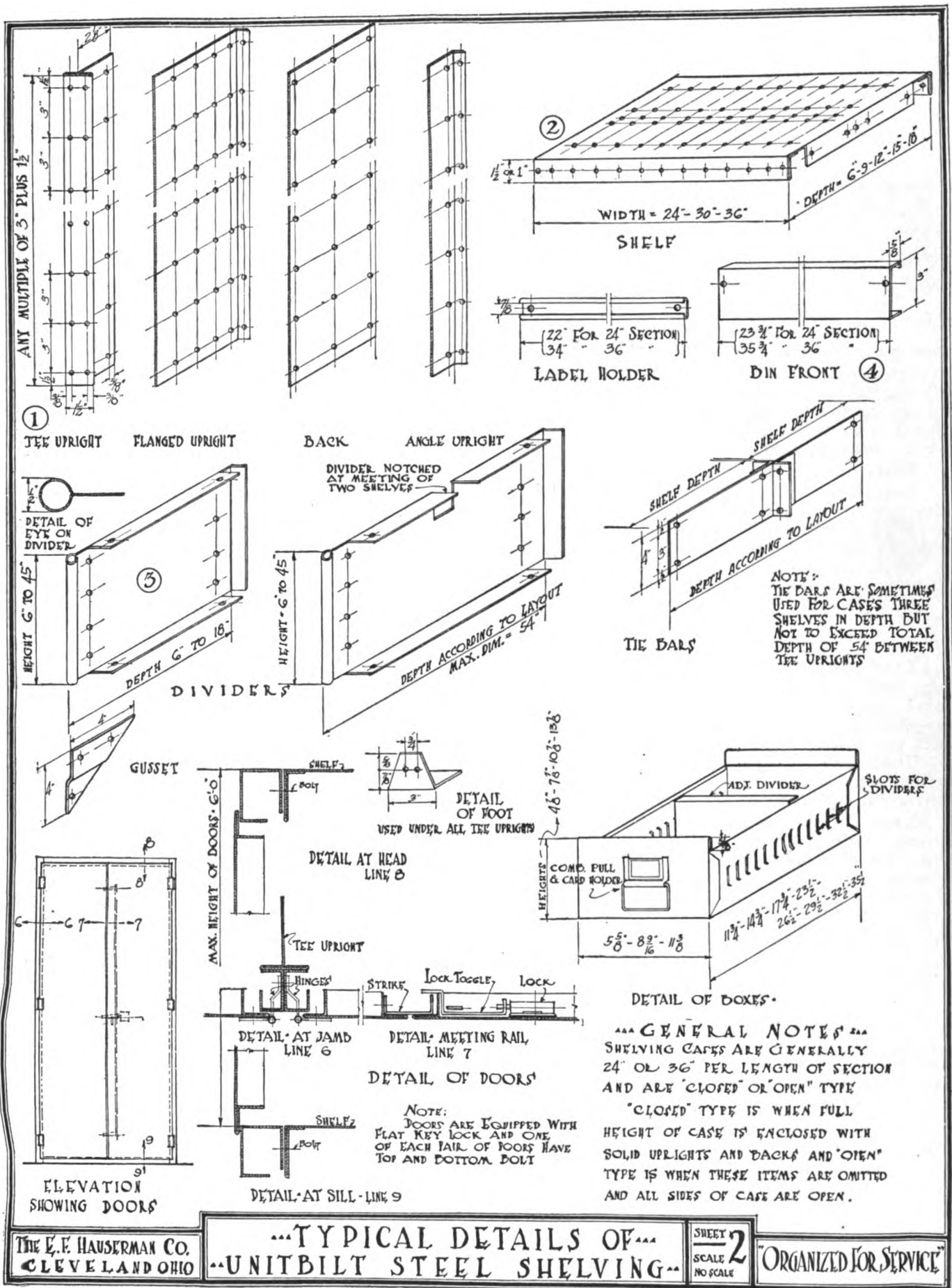


THE E. F. HAUSERMAN CO.
CLEVELAND OHIO.

“INSTALLATIONS AND ELEVATIONS”
“UNITBILT STEEL SHELVING”

SHEET 1
SCALE NO SCALE

“ORGANIZED FOR SERVICE”



LYON METALLIC MFG. CO.

Manufacturers of Steel Shelving and Steel Lockers

AURORA, ILL.

CHICAGO OFFICE, 835 Peoples Gas Building
NEW YORK OFFICE, 299 Broadway
CINCINNATI OFFICE, 2305 Union Central Building
PITTSBURGH OFFICE, 629 Oliver Building

DETROIT OFFICE, 1848 Penobscot Building
ROCHESTER OFFICE, 1110 Granite Building
BOSTON OFFICE, 161 Devonshire Street
PHILADELPHIA OFFICE, 519 Bulletin Building

Products

LYON ADJUSTABLE and EXTENSIBLE STEEL SHELVING and STORAGE RACKS; STEEL LOCKERS.

Also manufacturers of Steel Cabinets, including Blue Print and Stationery Cabinets; Steel Boxes, Barrels, Tool Boxes and Bench Drawers; Steel Benches and Tables; Steel Factory Desks, and Steel Enclosure Panels.

Lyon Steel Shelving and Racks

Standardization—Both "Open" (Skeleton) and "Closed" shelving are assembled from the same standard parts, which are interchangeable, reversible and adjustable. No special construction is required and racks may be easily rearranged to meet changing conditions.

Features of Lyon Standard Shelving—

Simplicity—Weighs less for guaranteed load than other types, fewer parts, easy to assemble.

Rigidity—Each stack rigid in itself. No fastening to floor or ceiling or bracing required.

Strength—Carries greater guaranteed load per weight of shelving than any other rack made.

Space Saving—Construction requires minimum floor area.

Fireproof—Approved by insurance authorities.

Lyon Standard Shelving for Heavy Loads—

Each shelf is put under compression against the face strip by two $\frac{7}{8}$ -in. diameter rods, on which it rests. The one-piece steel face strip is rolled and grips the partition sheet, to which it is spot-welded, on both sides.

The face strip design avoids the usual pocket behind the upright. With an ample factor of safety, Lyon shelves will support from 200 to 350 lbs. per sq. ft.

Lyon Commercial Shelving—Shelving consists of three members: uprights, shelves and shelf supporting clips. The shelves may be adjusted on $1\frac{1}{2}$ -in. centers. A screwdriver is the only tool required for erection. The commercial type shelving is particularly designed for loads which do not require the great strength of the standard shelving.

SUGGESTED USES OF LYON SHELVING

Standard Open (Skeleton)	Standard Closed	Commercial Open (Skeleton)	Commercial Closed
For heavy material which piles or stacks	For heavy material requiring bins or pockets	For material which piles or stacks	For material requiring bins or pockets
Metal pattern storage	Public service corporation shops	Wood pattern storage	Repair shops
Wholesale hardware houses	Warehouses	Wholesale drug stores	Retail hardware stores
Machinists supply houses	Tool rooms	Mercantile establishments	Supplies
Printing establishments for paper stock	Supply houses	Wholesale groceries	Repairs
Binderies	Machinists shops	Stationery houses	Light hardware
Factories	Factories	For display purposes in retail supply houses	
Warehouses	Stock rooms		

Complete plans, specifications and estimates on proposed installations will be furnished without charge.



SIZES OF LYON STANDARD BACK PARTS DIMENSIONS IN INCHES

PART No. 1. UPRIGHT PARTITIONS
Heights.. 48-54-60-66-72-78-84-90-
96-102-108-114-120-126-
132-144-156-168-180-192-
216-240
Depths.. 12-15-18-24-30-36-42-48

PART No. 18. SKELETON UPRIGHTS
Same as Upright Partitions

PART No. 2. SHELVES
Widths.. 18-24-30-36-42-48
Depths.. 12-15-18-24-30-36-42-48

PART No. 34. BACKS
Heights.. Same as Upright Partitions
Widths.. 18-24-30-36-42-48

PART No. 4. CROSSWISE DIVIDERS
Heights.. 5-8-11-14-17-20-23
Depths.. 12-15-18-24-30-36-42-48

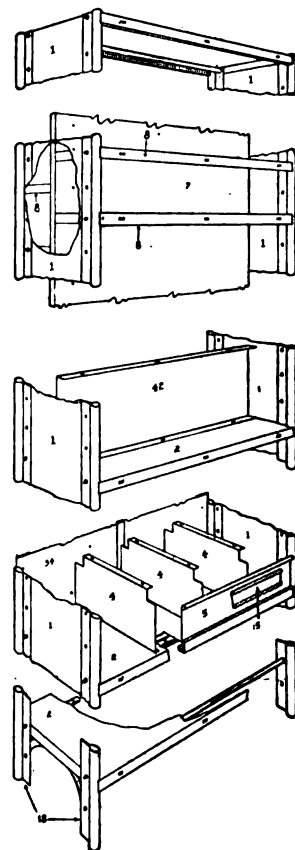
PART No. 42. LENGTHWISE DIVIDERS
Heights.. 5-8-11-14-17-20-23
Widths.. 18-24-30-36-42-48

PART No. 5. BIN FRONTS
Heights.. 2-3-4-5-6-8
Widths.. 18-24-30-36-42-48

PART No. 8. HALF SHELVES
Widths.. 18-24-30-36-42-48
Depths.. 12-15-18-24

PART No. 7. DIVIDING BACKS
Heights.. 48-54-60-66-72-78-84-90-
96-102-108-114-120
Widths.. 18-24-30-36-42-48

PART No. 15. LABEL HOLDERS
Heights.. $\frac{3}{4}$ -2
Widths.. 18-24-30-36-42-48



CONSTRUCTIVE VIEW, LYON STANDARD SHELVING PARTS

A Partial List of Lyon Shelving Installations, Each Amounting to More than \$20,000.00

American Can Co., various Plants
American Locomotive Co., Providence, R. I.
Anheuser Busch Brewing Association, St. Louis, Mo.
Bethlehem Steel Co., South Bethlehem, Pa.
Bosch Magneto Co., Springfield, Mass.
Boston Store, Chicago, Ill.
City of New York
Chicago Telephone Co., Chicago, Ill., various Divisions
Dayton Engineering Laboratories, Dayton, Ohio
Eastman Kodak Co., Rochester, N. Y.
Fisk Rubber Co., Chicopee Falls, Mass.; Milwaukee, Wis.
Ford Motor Co., Detroit, Mich.
General Electric Co., various Plants and Branches
General Motors Co., various Divisions
General Vehicle Co., Long Island City, N. Y.
Goodyear Tire & Rubber Co., Akron, Ohio, and Branches
International Harvester Co., various Plants and Branches
International Silver Co., various Plants and Branches

Other Lyon Steel Equipment for Factories, Warehouses, etc.

Blue Print Cabinets—For the storage of blue prints, drawings or other large flat pieces.

Work Benches, Counters, Foremen's Desks, Tables, Boxes, Barrels, etc.—Stock patterns.

Bench Drawer—All-steel, with one-piece dustproof and thiefproof top, combination device for flat key lock or padlock.

Bench Leg—All-steel, non-breakable, sanitary bench leg.

Lyon Steel Locker**Standard Sizes—**

SINGLE TIER		
Depth	Width	Height
12 in.	12 in.	60 in.
15 in.	15 in.	72 in.
18 in.	18 in.	
24 in.	24 in.	

DOUBLE TIER		
Depth	Width	Height
12 in.	12 in.	36 in.
15 in.	15 in.	42 in.
18 in.	18 in.	

Height does not include 6-in. legs.

Any combination of the above sizes makes up a Standard Locker.

Specifications and Equipment—**DOOR AND DOOR FRAME**

Construction—Full pickled cold rolled furniture steel. Sheet, lapped back on both sides, to form tubular reinforcement as shown, and provides double thickness of metal where hinges, locking device and handle are attached.

Upright member $1 \times 1 \times \frac{1}{8}$ -in. hard steel angles. Horizontal member $1 \frac{1}{2} \times \frac{3}{4} \times \frac{1}{4}$ -in. steel channels. All joints are lap-welded.

Hinges—Double butt hinge riveted to door frame and bolted to door. Number of hinges to be determined by height of door as follows:

- 72 in. high, 4 hinges
- 60 in. high, 3 hinges
- 42 in. high, 2 hinges
- 36 in. high, 2 hinges

Locking Device—Gravity actuated, controlled by special pivot handle and locked with either flat key, master-keyed Yale & Towne lock, or ordinary padlock. Number of locking points to be determined by height of door as follows:

- 72 in. high, 3 locking points
- 60 in. high, 3 locking points
- 42 in. high, 2 locking points
- 36 in. high, 2 locking points

Ventilation—By means of either "louver" or "standard" ($\frac{1}{2}$ in. round hole) perforations in doors. "Half" perforation as shown, or "full" perforated doors (perforations full length).

Body

Back and Sides—Full pickled cold rolled steel, flanged on four sides to give additional strength. Reversible and interchangeable with others of same size.

Top—Full pickled cold rolled steel made either flat or sloping. Flat tops and bottoms of same size are interchangeable.

Bottom—Full pickled cold rolled steel offset to fit inside and flush with top of cross channel of door frame. Bottoms and flat tops are interchangeable with others of same size.

Legs— $1 \times 1 \times \frac{1}{8}$ -in. hard steel angles 6 in. long; adjustable; have feet punched for securing to floor.

HAT SHELF

In single tier lockers only, placed $9 \frac{1}{2}$ in. from top in 72-in. lockers and 8 in. in 60-in. lockers.

Hooks

All lockers have 1 double prong ceiling hook. Lockers 12 in. wide have 1 single prong hook on back and 1 on each side. Lockers over 12 in. wide have 2 single prong hooks on back and 1 on each side.

FINISH

Two coats of olive green or black enamel baked on at a temperature to secure maximum toughness and durability.

NUMBERING

Each locker is numbered by means of an etched aluminum plate with back enameled sunken figures.

Method of Shipment—According to existing conditions and quantity shipped, either erected or knocked

**LYON STANDARD LOCKERS AND EXCLUSIVE FEATURES**

- (1) Door opening always true and square; reinforced one-piece door frame with welded corners.
- (2) Easily operated locking device; malleable handle; a single forward pull operates locking device and open door.
- (3) All corner joints have double overlapping flanges.
- (4) Back legs strengthen and stiffen entire locker base.
- (5) Overlapping flanges at door corners.
- (6) Door will always shut and latch properly.
- (7) Gravity actuated locking device; engages automatically by merely pushing door shut; simple, strong, and secure.
- (8) Impossible to pry door open; three locking fingers and three door jambs interlocked.
- (9) Locker door, because of rigid reinforcing, can not get out of alignment.
- (10) Hinge can not be forced; securely riveted in position. Door can not swing back against adjoining locker door.

down with complete erection instructions. Prices will also be quoted for lockers installed complete.

Information for Prices—Prices are based on quantity, size and arrangement. Complete information of the installation desired should be furnished when possible for lowest prices. Our engineering department will make suggestions as to the arrangement of the lockers, the size required, interior fittings, etc., without charge.

Please advise on the following:

- (1) Quantity.
- (2) Size.
- (3) Arrangement: single row (wall lockers); double row (back to back).
- (4) Sectionizing. Number of lockers or openings to each section in the above arrangement.
- (5) Furnish sketch of floor plan if possible.

Special Equipment

All types of special steel equipment can be made, such as special cabinets, boxes, etc. Special sizes of shelving and lockers can also be made when absolutely necessary, but only at a higher cost.

Standard sizes are made in quantities and carried in stock, which enables the company to give better service with a lower cost. The wide ranges of sizes will be found to answer practically every requirement.

DAVID LUPTON'S SONS CO.

Manufacturers of Steel Shelving, Racks and Bins

Allegheny Avenue and Tulip Street
PHILADELPHIA, PA.

For list of Sales Offices, see page 192.

Products

STEEL SHELVING, BINS and RACKS.

Also Bench Legs and Drawers, Tool Stands and Cabinets.

For Steel Sash, Sash Operating Devices, Steel Partitions and Skylights, see pages 192-200.

General Advantages of Steel Shelving

Despite the fact that the initial cost of steel shelving is usually somewhat greater than that of wood shelving, it is much more economical in the end, except for purely temporary installations.

The general advantages of steel shelving are as follows:

(1) Has from 10% to 30% greater useful storage space. (2) Has much longer life, especially under rough usage. (3) Acts as a fire retarder. (4) Does not splinter. (5) Can be taken down and re-erected without injury. (6) Can be adjusted for changes of material on shelves. (7) Encourages orderly habits and neatness of employees.

Lupton Bolted Steel Shelving presents the most effective combination of the advantages outlined above. Its parts are few in number; the reinforcements are incorporated permanently into the structures of the shelves and uprights; it can be erected by unskilled labor, using ordinary supervision and the instruction sheet furnished by us; the design is such as to give unusual strength and rigidity with moderate weight of metal, owing to the scientific distribution of metal at points of maximum stress. In tests, units of Lupton Bolted Steel Shelving have been loaded far beyond their rating without injury.

Lupton Bolted Steel Shelving

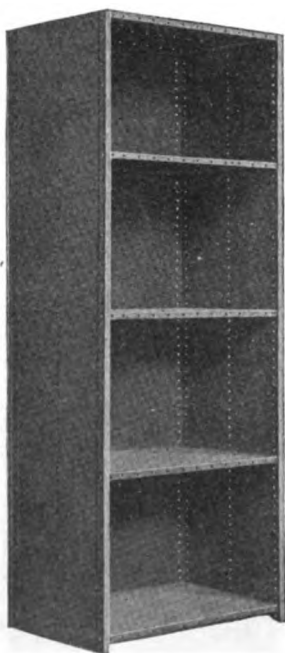
Open or Rack Type—The construction of this type is illustrated below. It can be furnished with detachable sides and back for converting it to the closed type. Side sheets are attached directly by bolts to the T-bar uprights, and the back sheets are attached by angle clips, using the holes already punched in the uprights. Racks of angle bars can also be furnished instead of sheet steel shelves.

Shipped completely knocked down and is assembled entirely by bolts.

Closed or Bin Type—In this type, the sides and back form the uprights. The front edges of the sides are formed permanently around flat reinforcing bars of higher carbon steel than could be used in metal to be worked cold. The effect is practically a T-bar construction with strength to support the shelves and resist shocks. The back edges of the sides are flanged and bolted to the back. Shipped completely knocked down and is assembled by bolts.

Attachments for Lupton Bolted Steel Shelving

Lupton Bolted Steel Shelving can be modified by means of attachments in order to adapt it to a great variety of uses. The original installation can be suited exactly to the materials to be stored, and a change in these materials involves only minor changes in attachments. Both shelving and attachments are designed so that the latter may be added or removed with minimum effort and by using the minimum number of parts. Besides the removable sides and backs for the rack type of shelving, the attachments include doors, bin fronts, bin dividers, label holders and counter extensions.



With Removable Sides and Back Attached

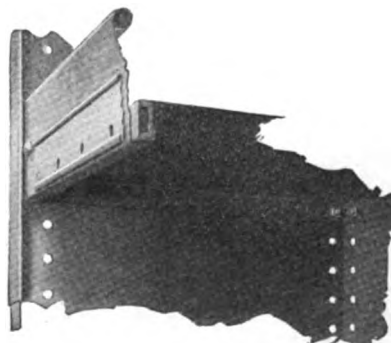
LUPTON OPEN OR RACK TYPE BOLTED STEEL SHELVING



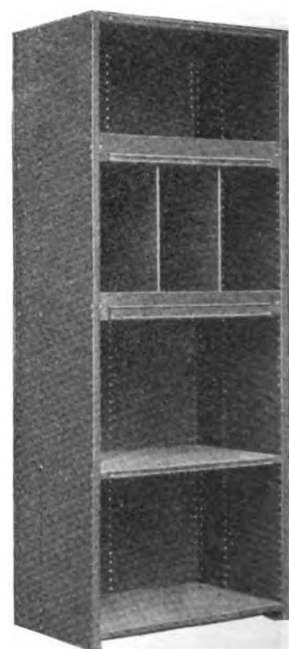
Without Sides and Back



DETAIL OF OPEN OR RACK TYPE SHELVING



DETAIL OF CLOSED OR BIN TYPE SHELVING



LUPTON CLOSED OR BIN TYPE SHELVING

PENN METAL COMPANY

Manufacturers of Steel Shelving and Lockers

65 Franklin Street
BOSTON, MASS.

SALES OFFICES

PHILADELPHIA, PA., 25th and Wharton Streets
HARTFORD, CONN., 28 Owen Street

PORTLAND, ME., 95 Exchange Street
JERSEY, CITY, N. J., corner of First and Washington Streets

Products

PENCO STEEL SHELVING and LOCKERS.

For Fire Resistive Doors, Metal Lath, Corner Beads, Studding, Ceilings and Roofing; Machine Guard Mesh; Concrete Reinforcement and Metal Specialties, see page 336.

Penco Steel Shelving

Penco steel shelving is simple and rigid in construction with parts interchangeable.

Made in two types: standard straight front and standard extension front (see illustration).

Angle uprights are hot rolled with true and sharp edges. Shelves are stamped in one piece, with special solid corners and fit against the angle uprights, adding greatly to their strength.

Shelves have 3-in. vertical adjustment; bin dividers have 6-in. horizontal adjustment.

Shipped knocked down. Finished in olive green enamel or galvanized.

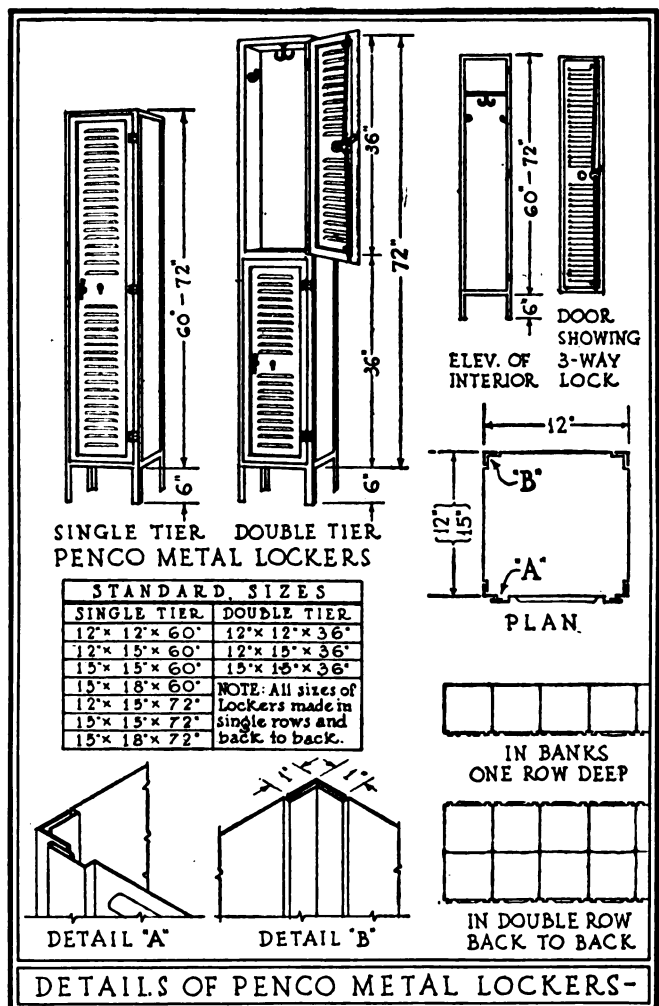
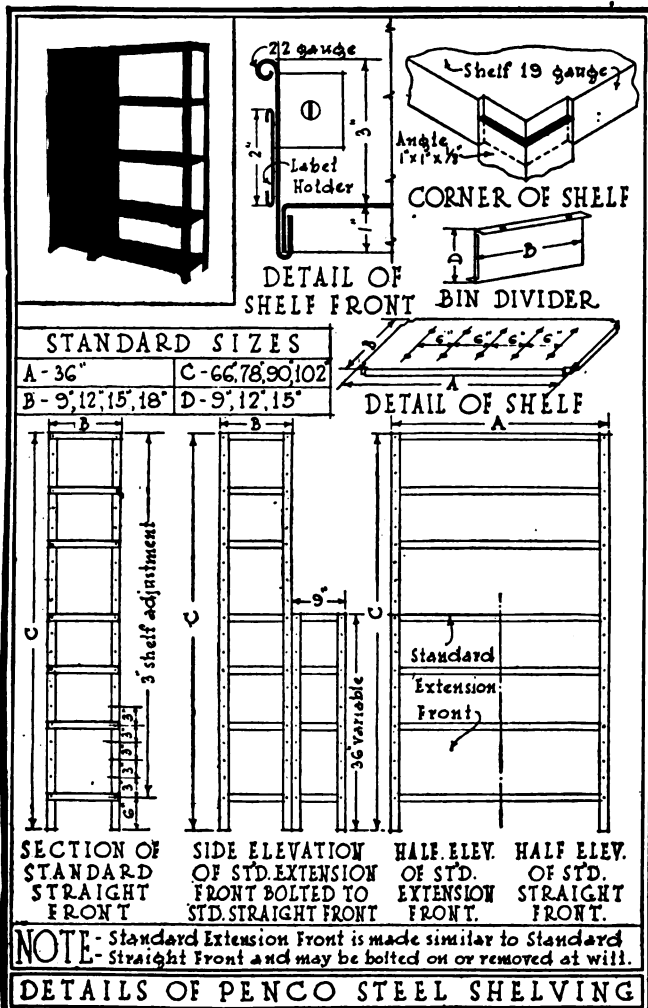


Penco Steel Lockers

Penco steel lockers are made in single tier, double tier (half height) and in double row (back to back). Front sections, including frame, door and hardware are welded together in one piece. Back sections made similarly in one-piece angle uprights, back panel being spot-welded together. Ends, tops, bottoms and shelves are punched for quick bolting to the back and front sections. Ends and back walls are No. 24 U. S. S. gauge; tops, bottoms and shelves of No. 22 U. S. S. gauge.

Doors are of No. 19 gauge metal reinforced on all edges, with full height ventilating louvers. Equipped with tee handle and cylinder lock, master-keyed if desired. Top shelf and wall hooks furnished in full length lockers. Wall hooks only furnished in double tier (half height) lockers.

Finished in two coats of olive green enamel baked on. Shipped knocked down or set up.



THE HALL'S SAFE CO.

CABLE ADDRESS
"HALL'S SAFE, N. Y."

P. O. BOX 846
CINCINNATI, OHIO

SALESROOM: WALKER SAFE Co., Inc., 388 Broadway, NEW YORK, N. Y.

Products

Manufacturers of FIREPROOF VAULT FRONTS and VAULT WORK; FIREPROOF SAFES.

Also Deposit Boxes, Vault Equipment and Wall Safes for apartment buildings.



TRADE-MARK

Fireproof Vault Fronts

Specifications—The contractor shall provide and place in position fireproof vault fronts known as the No. 1-AA manufactured by THE HALL'S SAFE CO., P. O. Box 846, Cincinnati, Ohio. The wall opening to be 79 in. high, 32 in. wide, 20 in. deep and must be built square, plumb and level. The single outer door to have 4 cross bolts, 1 up and 1 down, locking with a 4-tumbler combination lock, swinging on pin hinges, and the double inner doors to have flat bolts and key lock.

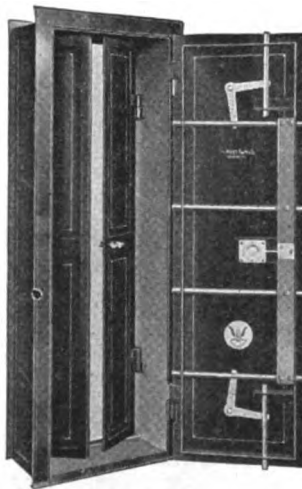
All handles, tips, dials and bolts to be nickelplated. Outer and inner doors to be painted black with ornamentation. Interior of vestibule to be painted a light color.

Installation—These vault fronts are so constructed that they can readily be placed in position by any mechanic after the vault walls are built and plastered, thus affording an opportunity for the walls to dry out thoroughly before the doors are set and avoid injury to the finished parts by dampness, plastering, etc.

Closing Device—An added feature to Hall vault doors is the self-closing device, which operates and closes the inner doors automatically. When the outer door closes this device eliminates the possibility of leaving the inner doors open when they should be closed. This closing device is not applied to the standard vaults unless specified, and an additional charge will be made.

Construction—The standard vault fronts are constructed for wall openings 79 in. high, 32 in. wide and 20 in. deep; thickness of door plates, number of bolts, bolt frames and weights as shown in table. The outer and inner door frames are fastened together with No. 16 gage steel plates, forming vestibule reinforced at all corners with $1\frac{1}{2} \times 1\frac{1}{2} \times \frac{1}{16}$ -in. angles and having a $3 \times \frac{1}{4}$ -in. sill bar.

The outer frame or architraves $3\frac{1}{2} \times 1\frac{1}{8}$ in., bolts 1-in. diameter, lock plate $4\frac{1}{2} \times \frac{3}{8}$ in., inner doors No. 14 gage, reinforced with $1\frac{3}{4} \times \frac{1}{8}$ -in. panel bars; the back flanges are removable $3 \times \frac{1}{4}$ in.



No. 1-AA FIREPROOF VAULT FRONT

Construction Data for Fireproof Vaults

Floors and Ceilings—Floors and ceilings should be strongly constructed with approved fireproof material, such as concrete, hollow tile or brick. Ceilings should be of sufficient strength to withstand falling weights.

Walls—The most satisfactory construction for fireproof vault walls consists of brick or concrete walls starting at the foundation and built up to the re-

quired height entirely independent of the building walls and floor construction. Walls to be of any desired thickness but not less than 8 in. thick and if of brick to be laid up in portland cement mortar. Added security against destruction by fire will be obtained by providing a lining of brick or hollow tile not less than

4 in. thick, with 2-in. air space between lining and outer wall.

Where hollow tile is used for walls in fireproof vault construction the tile should be made of good refractory clay, burned uniformly to a high temperature and set together with portland cement mortar. The tile to be not less than 6 in. thick and to weigh not less than 44 lbs. per cu. ft.

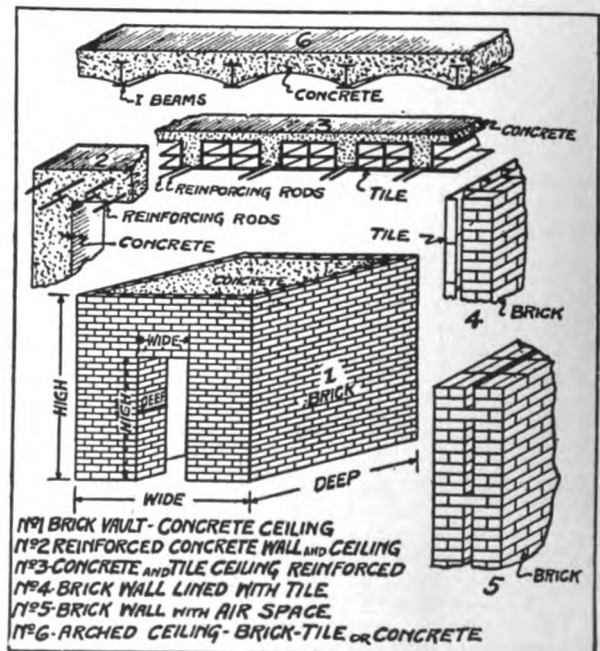


No. 10-AA FIREPROOF VAULT FRONT

Note: Burglarproof vaults are usually of special construction. Information in reference to the construction of burglarproof vaults furnished on application.

FIREPROOF VAULT FRONTS

No.	Wall opening, in.			Door plate, in.	Door on edge, in.	Bolts			Bolt frames, in.	Door	Weight, lbs.
	High	Wide	Deep			Cross	Up	Down			
Tile A	78	26	13½	¾	¾	2	1	1	Angle, 2x2½	Single	500
1-AA	79	32	20	1½	1½	4	1	1	Angle, 2x2½	Single	635
1-AAA	79	32	20	1½	1½	4	1	1	Angle, 2x2½	Single	635
3-C	79	32	20	1½	1½	8	2	2	Bar 1½x½	Single	1050
3-D	79	32	20	1½	1½	4	1	1	Bar 1½x½	Single	850
10-AA	82	44	24	¾	¾	8	2	2	Angle, 2x2½	Double	1000



TYPICAL DETAILS OF FIREPROOF VAULT CONSTRUCTION

Hall's Fireproof Safes

The Hall's patent filling used in the manufacture of Hall's safes is the greatest improvement in safe making for sixty years. Safes made under this patent are as near fireproof as is possible for human ingenuity to invent.

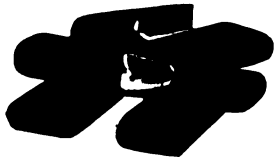
Construction—The Hall's patent filling is made up of hermetically sealed cement tubes in conjunction with Hall's special cement filling. The tubes are made in our works, under our formula and on forms of our design. They are placed within the space between the inner and outer shells and in the doors between the outside

plate and the inside cap. The special cement filling is poured in around them, making a safe with cement filling in addition to air space in the filling, giving a double security in case of fire, as illustrated.

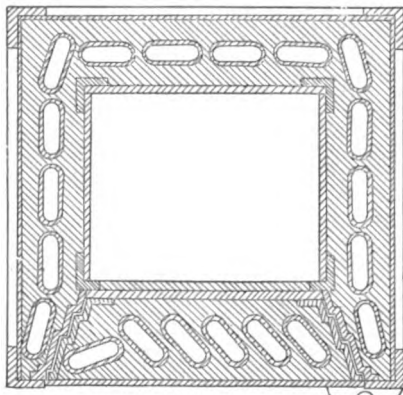
Advantages—By the use of these tubes a stronger, lighter, fireproof safe is obtained; one free from dampness, with no possibility of swelling, which heretofore has been the bane of safe makers.

Sizes—Hall's fireproof safes are made in all types, with any desired arrangement of inside cabinet construction.

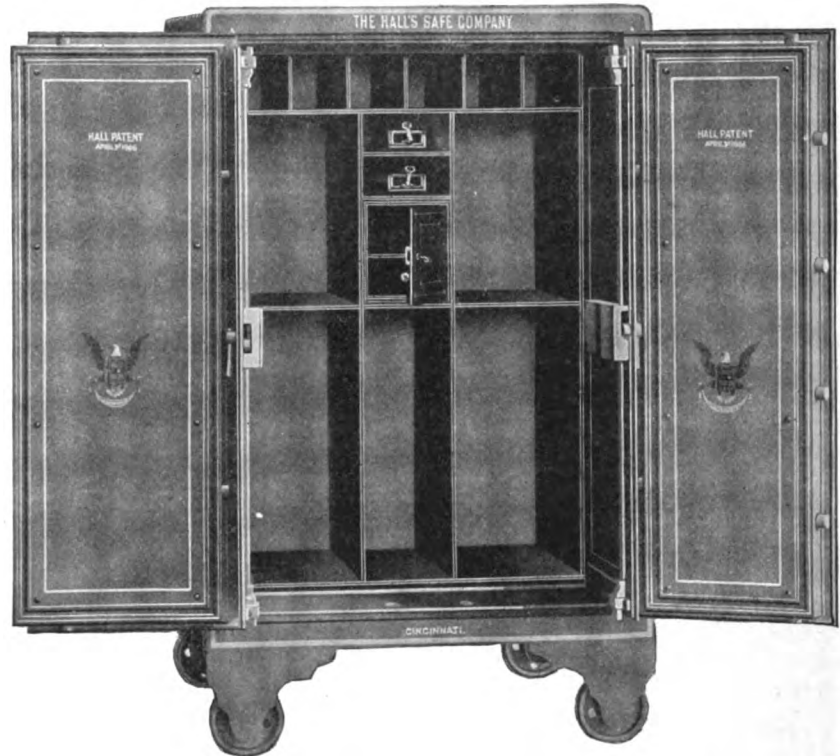
Made in all sizes for any use. Write for catalogue.



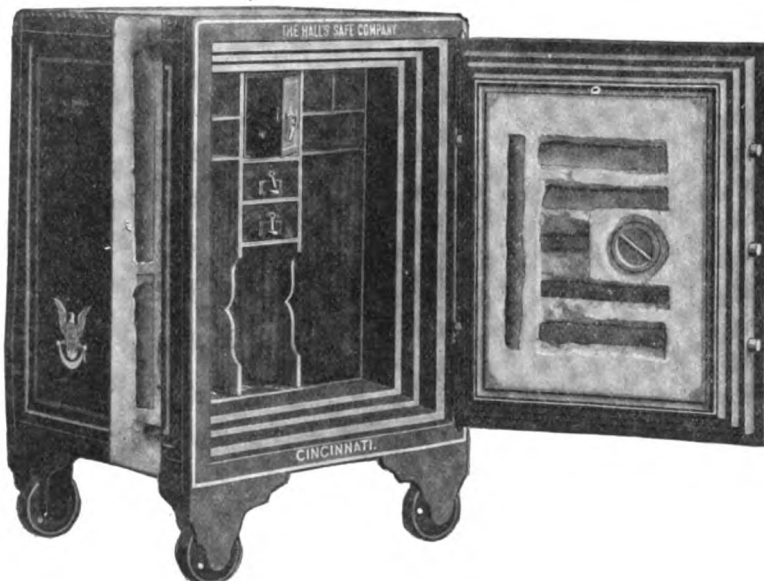
DETAILS OF THE HER-
METICALLY SEALED
TUBES USED IN
FILLING



DETAILS OF HALL'S PATENT FILLING
CONSTRUCTION
Method of placing tubes in walls



SAFE No. 360 (WITH INSIDE DOORS)
Combination lock-key lock if desired—size $53\frac{1}{2} \times 34\frac{1}{2} \times 27\frac{1}{2}$ in. (outside dimensions)



SHOWING HALL'S PATENT FILLING IN WALLS AND DOOR



SAFE No. 200 (NO INSIDE DOOR)
Combination lock-key lock if desired.
Size $27\frac{1}{2} \times 16\frac{1}{2} \times 18$ in. (outside dimensions)

AUTOMATIC ELECTRIC COMPANY

Automatic Telephone Equipments

FACTORY AND HOME OFFICE

Corner Morgan and Van Buren Streets

CHICAGO, ILL.

BRANCH OFFICES

BOSTON, MASS., 445 Tremont Building
NEW YORK, N. Y., 21 East 40th Street
PHILADELPHIA, PA., The Bourse Building
ROCHESTER, N. Y., 612 Mercantile Building
WASHINGTON, D. C., 905 Munsey Building

SAN FRANCISCO, CAL., 320 Market Street

PITTSBURGH, PA., 608 Fulton Building
DETROIT, MICH., 525 Ford Building
CLEVELAND, OHIO, 415 Cuyahoga Building
COLUMBUS, OHIO, 516 Ferris Building
KANSAS CITY, MO., 1001 New York Life Building

ASSOCIATED COMPANIES

INTERNATIONAL TELEPHONE SALES AND ENGINEERING CORPORATION, 21 East 40th Street, New York, N. Y.
INTERNATIONAL AUTOMATIC TELEPHONE CO., LTD., 60 Lincoln's Inns Field, London, W. C. 2

AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., Milton Road, Edge Lane, Liverpool, England
AUTOMATIC TELEPHONES (AUSTRALASIA), LTD., 77 King Street, Sydney, Australia

COMPAGNIE FRANCAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON, 13 Passage des Favorites, Paris, France

Products and Services

Manufacturers and installers of AUTOMATIC TELEPHONE SYSTEMS for private and public service.

History and Adoption

The Automatic system was first utilized for city exchanges and has been thus serving in numerous cities in America and abroad for over 25 years.

During the past 20 years, this equipment has been adopted extensively for private interior exchange service, and is now in operation in many of the most representative organizations throughout the world.

Among these users may be mentioned, as typical, the Federal Reserve Bank of New York, Sears, Roebuck & Co., The Goodyear Tire and Rubber Co., Bellevue Hospital of New York, James Deering's residence at Miami, Fla., and many important government institutions in America and abroad.

Instruments

The instruments in this system are similar to those of the ordinary telephone system, with the exception of raised dial $2\frac{1}{4}$ in. in diameter, which has around its rim 10 holes numbered from 1 to 0, and is revolved by means of the finger.

Of the instruments there are various types; wall, desk, hand, mine, and others specially designed for particular purposes.

Automatic Exchange

This apparatus takes the place of the manual switchboard and the operator, and is placed in any convenient or available space, the size of which depends on the size of the system. Neither natural light nor ventilation is essential.

The apparatus is entirely self-contained, enclosed in a glass cabinet, and sufficiently attractive in design



AUTOMATIC DESK TELEPHONE
No larger and no heavier than the manual



AUTOMATIC WALL TELEPHONE
 $6\frac{1}{4} \times 7\frac{1}{2} \times 4$ in.; ebony finish



HAND TELEPHONE
Light, compact, handy; 9 in. long. When not in use hangs from hook under desk

and finish to be installed in a conspicuous place.

The private automatic exchange switchboard is designed to serve any number of stations from 20 to 2000 or more.

Automatic Electric Services

In addition to interior telephone service this equipment renders a group of affiliated services all controlled and operated by the Automatic exchange and involving but slight extra wiring or expense.

Any or all of these services may be included in the initial installation, or added later, as required. Some of these services are:

Code Call—By which code signals can be sent out to horns, bells, lights, etc., in all parts of the establishment, to locate a person not at his desk.

Conference Wire—By which three or more persons can meet and confer telephonically.

Emergency Alarm—For fire or other emergencies. This may be a general alarm, or may give both "still" and general alarms.

Watchman's Service—Giving a complete check on the activities of watchmen, co-ordinating their activities and keeping them constantly in touch with the chief watchman or other official.

Method of Operation

The person who is calling lifts the receiver in the customary manner, and connection is then made by rotating the dial. If station 65 is wanted the finger is placed on the dial hole over 6 and drawn around to the finger stop. Then the finger is removed, and the dial revolves back to its original position. The operation is repeated for the number 5. This completes the connection and rings the bell at Station 65. It requires but two seconds to make such a call.

The ring is heard in the receiver of the calling station, and is repeated at intervals until the called station answers or the receiver is hung up at the calling station. If the station wanted is engaged, a distinct buzz is heard by the person calling. The hanging of the receiver on the hook breaks the connection, and another call can be made immediately.

The system is so flexible that those who do not wish to make their own calls can have their telephones so arranged that a clerk or stenographer can dial the connections for them.

Guarantee

The Automatic system is warranted to give absolutely satisfactory service and is guaranteed against defects of material or workmanship for one year.

Full and precise data and specifications gladly furnished on request.

Specifications for the P-A-X Type Interior Telephone

(A) In General—This contractor shall furnish and install a two-wire automatic telephone system of the AUTOMATIC ELECTRIC COMPANY'S P-A-X type, or equal, as approved by architect, to consist of the apparatus described below. The system shall provide the following services:

a—All stations shall be able to communicate with each other.

b—Any two stations shall be able to communicate without the possibility of being overheard or interfered with by a third station.

c—Access by any station to any line already in talking relation with another line to be automatically prevented, and a busy signal shall be transmitted to station attempting such connection.

d—Selection of number shall be made by a dial attached to each telephone.

e—Ringing of bells shall be automatically controlled from the switchboard without necessity of a ringing key or button at the telephone.

f—Provision shall be made for allowing a conference of three or more persons on one predetermined switchboard number.

g—Switchboard must be designed so that a full automatic code call system may be added at any time at the option of the purchaser.

h—Switchboard shall be so designed that the system can be expanded indefinitely, retaining all features specified above.

(B) Switchboard—The switchboard shall have a capacity of lines and be equipped at present with lines. Additional lines to be added without any alterations in the original equipment up to specified capacity.

Switchboard to be complete with switching mechanism. Also power panel containing voltmeter and ammeter and an automatic device for maintaining storage battery charge. Approved alternating current ringing and busy machine to be mounted on the switchboard.

(C) Telephones—The telephones shall be of the wall and desk types as follows:

..... Wall Type
..... Desk Type

Finish of telephones to be standard black enamel with nickel trimmings. Each telephone shall have a calling dial as an integral part of itself. Such dial to consist of a revolving disc having ten finger holes under which shall be mounted a stationary plate containing the figures 1, 2, 3, 4, 5, 6, 7, 8, 9, 0.

All telephones shall be provided with long distance type transmitters and receivers. Ringers shall be of the polarized double gong type.

(D) Battery—The necessary current for all operating, transmission and ringing purposes shall be furnished by one storage battery of approved telephone type, battery to be a ampere hour battery, type Electric Storage Battery Co.'s make or approved equal. Battery to have glass jars.

Motor generator charging set to be of watt capacity.

(E) Wiring—All telephone wiring shall be of No. 19 B. & S. gauge copper twisted pair, braided, rubber covered interior telephone wire of first quality. A single pair of wires shall be used from each telephone directly to the automatic switchboard, or to the nearest distributing cable terminal. Where found more convenient standard No. 22 gauge silk and cotton insulated lead covered switchboard cable may be used from local distributing points to the switchboard. Cable wires and telephone distributing wires shall be terminated on approved terminal blocks mounted in approved cabinets.

(F) Conduits—Contractor shall run conduits in the switchboard room between the various pieces of apparatus according to the manufacturer's blue print layout.

(G) Installation—This contractor shall install all apparatus and connect all telephones, and shall turn the entire system over to the owner in first class operating condition. Switchboard installation shall be according to specifications furnished by the manufacturer.

STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY

GENERAL OFFICES AND FACTORIES

1050 University Avenue
ROCHESTER, N. Y.

BRANCH SALES OFFICES

CHICAGO, ILL., 710 West Jackson Boulevard

TORONTO, CAN., 10 Front Street, East

KANSAS CITY, MO., Coca-Cola Building

Products

Manufacturers of INTER-COMMUNICATING TELEPHONE SYSTEMS, TELEPHONE APPARATUS, TELEPHONE CABLES and SUPPLIES.

Inter-communicating Telephone System No. 1

Selective ringing, selective talking, with 6-, 12-, 22-, and 32-station capacity; cost of a switchboard system and an operator's salary are saved; each telephone station may select, ring and talk with any of the other stations *without interference with remaining stations which may be using system simultaneously.*

Adaptability—For offices, factories, public buildings, large residences, etc., where simultaneous conversations are necessary.

Service—This consists of three kinds: (1) For communication between a certain group of local stations. (2 and 3) This local service with additional service to and from city or town telephone system of either the "central energy" or local battery type, by means of one or more exchange trunk lines. One station on local system designated as the answering station.

The telephone exchange may be of two styles: (a) "central energy" type, with which the answering station handles and transfers *incoming calls only*—the outgoing calls being controlled from each local station; (b) "generator call" type, where both the incoming and outgoing calls are conducted through the answering station.

Standard Equipment—All telephone apparatus and accessories, including desk, wall and combination telephones, long distance transmitters and receivers, 3-position type switching key mechanism, key boxes, extension bells and other trunk line equipments, cables, terminal boxes, mounting standards, bell ringing transformers, batteries, etc. Each part is of the same high quality as used in regular city exchange systems.

Operation—*To Establish Connection*—Press 1 button *once only*; same button is used for selecting and ringing desired telephone. Push button switching keys have three operating positions—normal, talking and ringing; pushing button all the way down closes a circuit which *causes bell of distant telephone to ring*; button being released, it snaps back half way to *talking position*, completing talking circuit with the telephone called; receiver is then removed and conversation may begin.

Switching keys interlock by means of a tumbler plate so that, when any call is made, any key button still remaining in talking position is restored to normal position when any other key button is pressed.

To Answer a Call—Connection is made with party calling by pressing the white "home" button and by taking receiver from hook; "home" button is restored automatically when next call is made on system.

Telephones for System No. 1

Desk Telephones—No. 905, for use at regular stations, consists of two pieces—a No. 989 desk stand and either a No. 8R, 9R, 10R or 11R key box. For answering stations the same code number instruments are used, but connected as indicated for answering stations on wiring diagrams which are supplied with the instrument.

Key boxes contain switching key, vibrating ringer, impedance coil and line and battery terminals; directory spaces opposite each key button for inserting names of stations; removable covers for testing and inspection.



No. 905-A DESK TELEPHONE

DESK TELEPHONES FOR SYSTEM NO. 1

Code No.	Station capacity	Desk stand No.	Key box No.	Key box mounting space, in.	List price
905-A	6	989	8R	4¼ x 6¾	\$69.00
905-B	12	989	9R	5¼ x 6¾	78.00
905-C	22	989	10R	5¼ x 9¾	108.00
905-D	32	989	11R	5¼ x 12¾	126.00

DESK TELEPHONE PARTS FOR SYSTEM NO. 1

Code No.	Type and capacity	Key box mounting space, in.	List price
989	Desk telephone		\$33.00
8R	Key box 6 stations	4¼ x 6¾	36.00
9R	Key box 12 stations	5¼ x 6¾	45.00
10R	Key box 22 stations	5¼ x 9¾	75.00
11R	Key box 32 stations	5¼ x 12¾	93.00

Wall Telephones—No. 903 is regularly manufactured and carried in stock with a quarter sawed oak cabinet having a dull golden oak finish and nickelplated trimmings. Built in four sizes.

All apparatus (except switching key) mounted within hinged front section of cabinet, affording convenient access.



No. 903-B TELEPHONE
Wall Type

WALL TELEPHONES FOR SYSTEM NO. 1

Code No.	Station capacity	Key box mounting space, in.	List price
903-A	6	6¼ x 11¾	\$57.00
903-B	12	6¼ x 11¾	66.00
903-C	22	6¼ x 14½	99.00
903-D	32	6¼ x 17¾	126.00



No. 1128-A TELEPHONE

Combination Type No. 1128
—Convenient for either office or residence use.

Installed as either a wall or desk telephone outfit.

Battery—Two separate sets of dry cells required to operate system—one set of about 7 cells to supply for talking purposes, and other set of 7 to 10 cells for ringing the telephone bells.

Number of cells in ringing battery depends on length of lines.

COMBINATION TELEPHONES
FOR SYSTEM NO. 1

Code No.	Station capacity	Combination telephone	Key box No.	List price
1128-A	6	10-I	8R	\$ 75.00
1128-B	12	10-I	9R	84.00
1128-C	22	10-I	10R	114.00
1128-D	32	10-I	11R	132.00

Cabling of System—Cables contain all wires (Nos. 18 and 22 B & S gauge copper) necessary for operation of system; full metallic circuit wiring between all stations; any pair of wires are identified by their coloring, making installation work easy. Each wire is tinned and insulated with servings of silk and cotton in opposite directions. Splices or junctions in cable should be made with the terminal boxes (for all sizes of cable).

Types of Cables—(1) Braided sheath type, recommended for interior use. (2) Leaded type, for all outdoor use or places subject to excessive moisture or corrosive fumes, dampness, etc.



CABLE

Inter-communicating Telephone System No. 2

Service is equivalent to No. 1 System with these exceptions:

(1) It transmits one conversation only at a time; and (2) it is not arranged for connection with a public service telephone exchange.

Any or all stations may be called in rapid succession. Wiring arranged for local service between all stations.

Adaptability—Used for small size local service systems, such as small commercial establishments, factories, clubs and residences. The circuits are simple and do not require the 3-position switching key.

Sizes—Instruments and accessories furnished in two standard sizes: for 6 and 11 stations.

Installation and Operation—Further details will be mailed on application.

No. 1122-B WALL TELEPHONE
FOR SYSTEM NO. 2
Mounting space, $5\frac{1}{4} \times 9$ in.

Inter-communicating Telephone System No. 3

A central station system for communication between one master station and a number of outlying stations as in schools, small hotels and public institutions. Arrangement provides for talking and ringing between master station and all outlying stations over a 3-wire circuit—2 common talking circuit wires and an individual signalling wire to each station. Outlying stations can not call each other direct, but must first call the master station, which in turn calls desired station. All calls, therefore, are checked. One conversation only can be maintained at a time.

Equipment—Master station is equipped with both wall and desk telephones similar to those illustrated on preceding page; outlying stations are fitted with desk, wall and combination telephones, impedance coil (for regulating supply of current to transmitters of the various telephones) and all accessories.

Sizes—Instruments and accessories are furnished in four sizes: for 5, 10, 20 and 30 stations. A complete system need not be installed at the beginning—additional stations can be provided at any time, if master station capacity is of sufficient size.

No. 965 WALL TELEPHONE FOR
SYSTEMS NO. 3 AND NO. 4
Mounting space, $5\frac{1}{4} \times 7\frac{3}{4}$ in.

Inter-communicating Telephone System No. 4

For communication between any two points not farther than 1500 ft. apart. An ideal equipment for a private line between two offices, two departments in a factory, and for house to garage lines, etc.

Equipment—System No. 4 is equipped with wall, desk and combination telephones and other necessary accessories.

Heavy Duty Telephone for Industrial and Mine Use

No. 890 Mine-A-Phone is especially built to resist mechanical and chemical injuries such as rough handling, cave-ins, and action of acid waters, gases and dust, which makes it particularly suitable for installation in mines, industrial buildings and yards.

The complete apparatus, which is a five-bar generator type, is contained in a black enameled cast iron box fitted with an inner door, felt sealed, protecting the operating mechanism and an outer door, rubber sealed, protecting the talking equipment which is moistureproof.

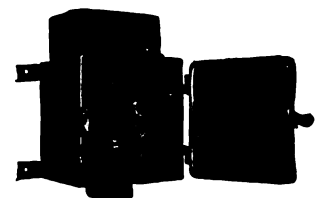
The ordinary form of gravity controlled hook-switch has been replaced by a positive spring controlled hookswitch, more suited to rough work.

Prices and Further Information

On receipt of full particulars, estimates and detailed information, with catalogues, bulletins, etc., will be mailed without delay.

References

Extensive lists of satisfied users of this company's inter-communicating telephone systems will be forwarded to interested inquirers on application.



No. 890 MINE-A-PHONE

THE JOHN E. MANNEN COMPANY

Manufacturers of Sheet Metal Specialties

CLEVELAND, OHIO

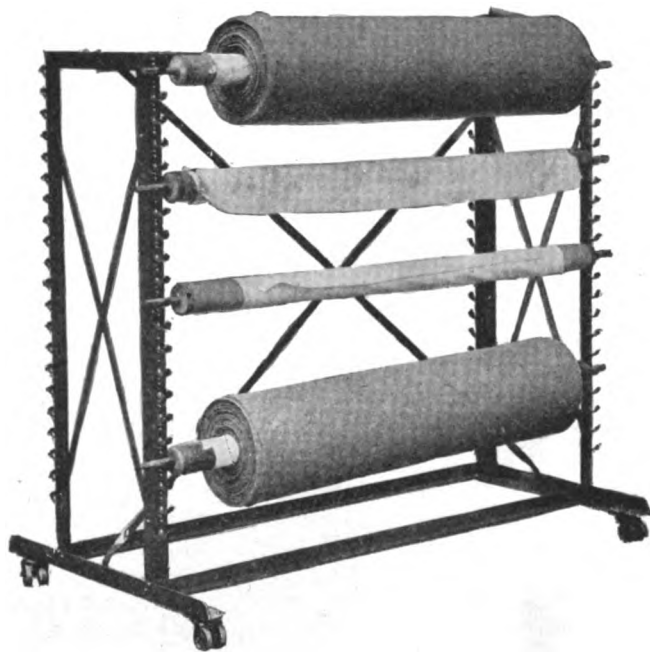
Products

CLOTH RACKS and CARRIERS; PERFORATED METAL WASTE PAPER CANS; PERFORATED and PLAIN METAL GUARDS.

Also manufacturers of Shop Pans, Exhaust Systems, Japan Ovens, Tin Pans and Boxes, Metal Concrete Forms.

Cloth Racks and Carriers

The illustration of this article will give the reader a good idea as to its strength and usefulness in large clothing and tailoring establishments, or wherever large rolls of cloth or paper are used continuously.



CLOTH RACK AND CARRIER

Dimensions: 73 in. wide; 40 in. deep at base, 20 in. deep at top; 60 in. high.

Full details will be given on application.

Perforated Metal Waste Paper Cans

This can is used for collecting waste paper in schools, office buildings, factories, freight offices, and wherever large quantities of waste paper accumulate.

It has four rollers, and weighs but little due to the perforation, making it very easy to handle. It is sturdy in construction.

Sizes: 30 in. high; 16, 20 and 24 in. in diameter.

We also make shop cans of any description and will be pleased to quote from blue prints in any quantity.

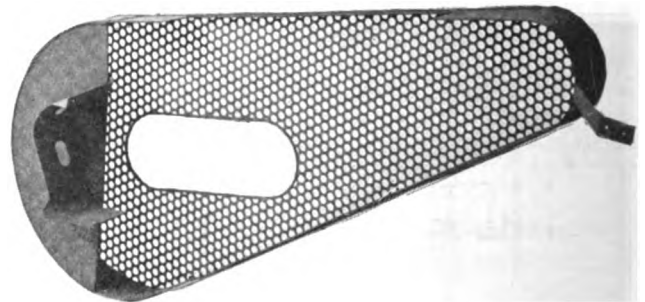


WASTE PAPER CAN

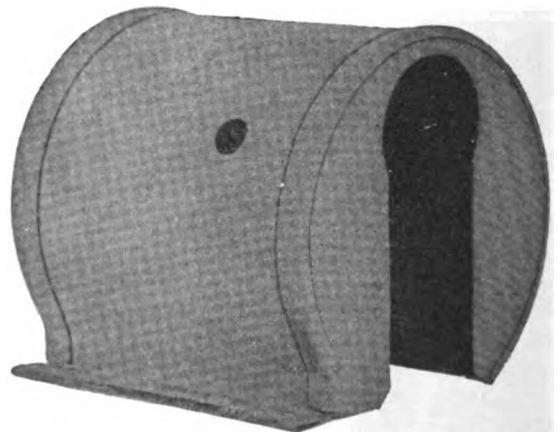
Perforated and Plain Metal Guards

These guards can be made to fit any machine—either for gears, pulleys, shafts or rolls.

Prices quoted on application; full description on blue prints furnished on request.



PERFORATED METAL GUARD



PLAIN METAL GUARD

THE JOHN VAN RANGE COMPANY

Equipment for the Preparation and Serving of Food

CINCINNATI, OHIO

CHICAGO, ILL.

BRANCH OFFICES

DETROIT, MICH.

CLEVELAND, OHIO

Products and Service

EQUIPMENT for the PREPARATION and SERVING of FOOD, planned, manufactured and installed for hotels, restaurants, cafeterias, factories, industrial corporations, clubs, institutions and hospitals.

Experience

For over 71 years THE JOHN VAN RANGE COMPANY has been planning, making and installing cooking and serving equipment on a large scale, and installations are to be found in every part of the United States, including the largest cities and the smaller towns. No installation too large; none too small to receive expert attention.

Regarding Van's Special Service

Van's engineers are men of much experience, and they personally supervise the planning and installation of all equipment. They are on the job continually and attend to every detail. The finished installation is turned over to the customer in perfect working order.

Van furnishes cooking and serving equipment installations complete and ready for instant use.

The plan shown below was made for one of Van's latest equipments. The photograph shows the completed installation in the Greenbrier, White Sulphur Springs, W. Va.

Van specializes in cafeteria equipment.

References

The following partial list of concerns served by Van is in itself the strongest testimonial needed of the quality, adaptability, and efficiency of Van's equipment.

Greenbrier Hotel, White Sulphur Springs, W. Va.

La Salle Hotel, Chicago, Ill.

Rainbow Hotel, Great Falls, Mont.

Burroughs Adding Machine Co., Detroit, Mich.

Willys-Overland Co., Toledo, Ohio

Procter & Gamble, Port Ivory, N. Y.

Macbeth-Evans Glass Co., Evansville, Ind.

U. S. Playing Card Co., Cincinnati, Ohio

Baldwin Cotton Mills, Chester, S. C.

Atlanta Athletic Club, Atlanta, Ga.

Fred Harvey Restaurants, Santa Fé R. R.

Maison-Blanche Co., New Orleans, La.

Bloch & Company Restaurants, Indianapolis, Ind.

Hotel Cleveland, Cleveland, Ohio

Hotel Blackstone, Chicago, Ill.

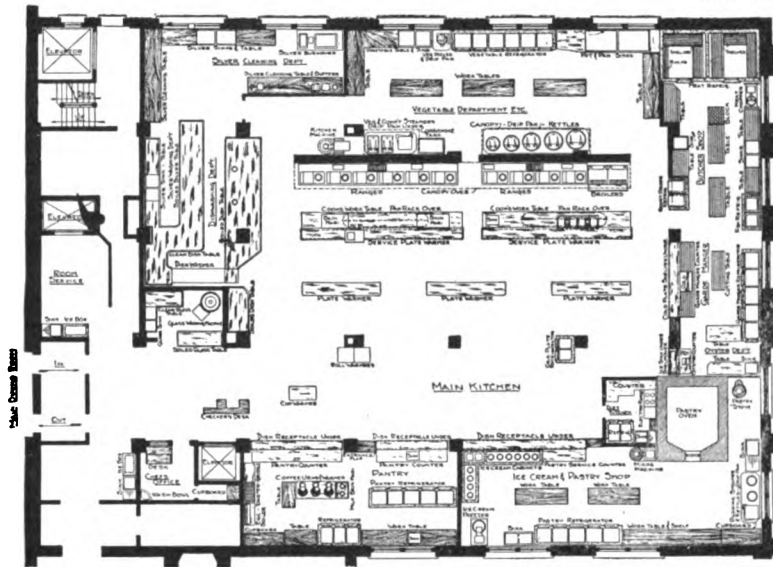
Patten Hotel, Chattanooga, Tenn.

Cincinnati General Hospital, Cincinnati, Ohio

Henry Ford Hospital, Detroit, Mich.

Battle Creek Sanitarium, Battle Creek, Mich.

United States Penitentiary, Fort Leavenworth, Kans.



EQUIPMENT for the PREPARATION and SERVING of FOOD in THE GREENBRIER HOTEL, WHITE SULPHUR SPRINGS, W. VA.

Van engineers made the plans and installed the equipment

EUREKA MACHINE COMPANY

Manufacturers of Superheaters, Branding Machines, and Cooperage Coating Sprays

2615 Vega Avenue
CLEVELAND, OHIO

SOLE AGENT FOR GREAT BRITAIN: MATTHEW WYLIE & Co., GLASGOW, SCOTLAND

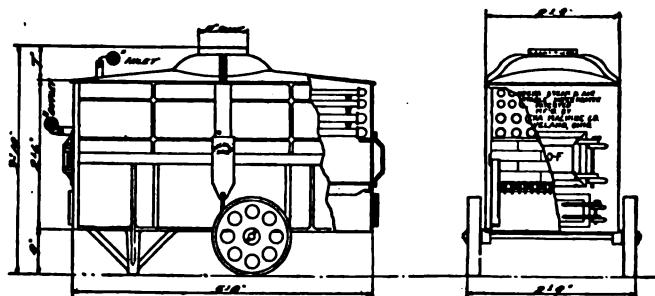
Products

SUPERHEATERS; ELECTRIC BRANDING MACHINES;
COOPERAGE COATING SPRAYS.

Eureka Portable Superheater

This machine is designed for superheating ordinary saturated steam to extremely high temperature and for compounding, cooking and rendering materials of heavy consistency such as tar, pitch, fats, heavy greases and oils, medicines, disinfectants, etc., where fire is ordinarily used.

The Superheater can be placed convenient to the using point and gives a steady flow of high temperature



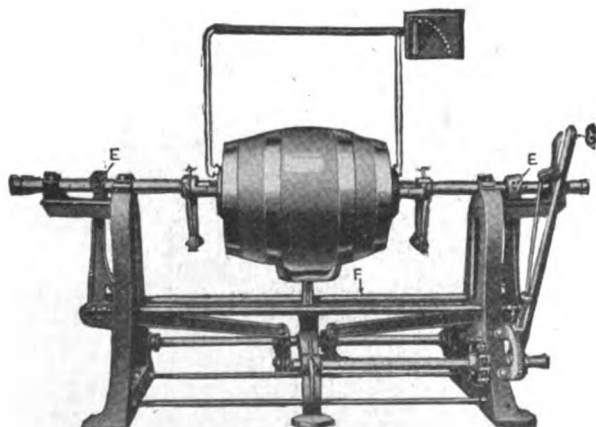
DIMENSION DIAGRAM 'EUREKA PORTABLE SUPERHEATER
Weight 2000 lbs. Two smaller sizes

steam with low steam pressure, saving the strain on steam boilers.

This machine is indorsed by the National Board of Fire Underwriters, as a safety appliance where high temperature is applied to combustibles.

Electric Branding Machine

This branding machine is used for branding name, location and trade-marks on barrels, kegs, tubs and boxes



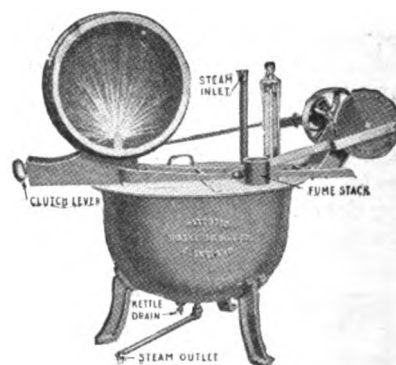
NO. 3 RAPID DUPLEX BRANDING MACHINE
Weight about 900 lbs. Two styles, to be heated with gas, gasoline or electricity

and will brand both ends of a barrel or box in one operation.

Cooperage Coating Spray

Cooperage coating spray, for coating the interior of barrels, drums, kegs, buckets, tubs, etc., with glue, paraffin, silicate of soda, pitch, paint or any protective lining.

One of these sprays will do the work of three men and do it better with a saving of time and material.



COOPERAGE COATING SPRAY MACHINE

Weight, 675 lbs.; floor space, 3x5 ft. Capacity, as fast as operator can handle the cooperage. Three sizes, hand or power. Material in kettle can be heated by steam or direct coal or gas fire

The spray will throw any liquid coating 40 ft. in all directions, and will cover the interior of a 100-gal. cask as readily as that of a small bucket. It does not matter how much coating is forced into a package, only a thin coating will adhere and the surplus flows back into the kettle.

A package is laid over spray nozzle, the clutch is thrown in and after pump has made from 6 to 8 strokes the clutch is thrown out and the package is coated.

This machine can also be used for *washing the interior of barrels and drums*. The washing solution and water are mixed in the kettle. A barrel is laid over spray nozzle and the pump clutch thrown in. This washes and flushes out the barrels. When barrels are washed the kettle is drained and barrels can then be coated.

Partial List of Firms Using Eureka Products

H. J. Heinz Co.	California Barrel Co.
Michigan Sugar Co.	Illinois Cooperage Mfg. Co.
E. I. du Pont de Nemours & Co.	Procter & Gamble Co.
Armour & Co.	American Electro Products Co.
Grasselli Chemical Co.	Lehigh Portland Cement Co.
Southern Cotton Oil Co.	Magnolia Petroleum Co.
Union Distilling Co.	Sherwin-Williams Co.
U. S. Navy	Gifford & Cullum.

PAASCHE AIR BRUSH CO.

Manufacturers of Industrial Finishing Equipments

1905 Diversey Parkway
CHICAGO, ILL.

Products

INDUSTRIAL FINISHING EQUIPMENTS; PAINT, VARNISH AND ENAMEL SPRAYING APPARATUS; PNEUMATIC RUBBING MACHINES.



TRADE-MARK

Paasche System of Applying Industrial Finishes

The Paasche system has revolutionized methods of applying paint, varnish and enamel finishes. It saves material and labor; with it one man can do six to eight times as much work as with a hand brush.

The component parts of the Paasche system are the result of years of exhaustive experiment and practical experience in all fields of industrial painting and embody all of the essentials necessary to successful and economical operation.

The Paasche system consists of the following:

- (1) A *steel finishing cabinet* with wired glass sides and top to admit light. Many styles and sizes.
- (2) A *turntable* permitting material to be raised, lowered and turned by operator simply turning a valve.
- (3) A *compressor equipment* assembled in one unit for operation by motor or other power drive.
- (4) An *air regulator* permitting instantaneous adjustment of pressure from 1 to 100 lbs.
- (5) A *combination water and oil separator* which gathers and removes oil and water from the air line, insuring perfect application of finishes.
- (6) A *combination air and material heater* which insures a free and even flow of spraying materials.
- (7) An *air brush* giving instantaneous control from a fine to a wide spray by simple finger pressure.
- (8) An *exhaust unit* which thoroughly removes all fumes and odors incident to the operation of the spray.
- (9) A *reflector* permitting work to continue on dark or cloudy days.

Send for Industrial Finishing Equipment Catalogue.



COMPLETE PAASCHE INDUSTRIAL FINISHING EQUIPMENT

Paasche Portable Painting Outfits

Paasche portable painting outfits have proved themselves superior in every respect, and are furnished

SWEET'S CATALOGUE

complete in every detail in sizes and styles to fit each need in this field. These outfits are used by thousands of institutions for all general painting purposes, both interior and exterior.

Send for Portable Painting Equipment Catalogue.



No. 55. GASOLINE PORTABLE PAINTING OUTFIT

Outfits No. 55 and 59—Complete one-man equipment with gasoline engine and electric driven compressors respectively.

Outfits No. 74S and 76S—Complete two- and five-operator equipments, respectively, with gas engine driven compressors.

Painting Unit No. 81—For use where compressed air is already available; not equipped with a compressor.

Superior Pneumatic Rubbing Machines

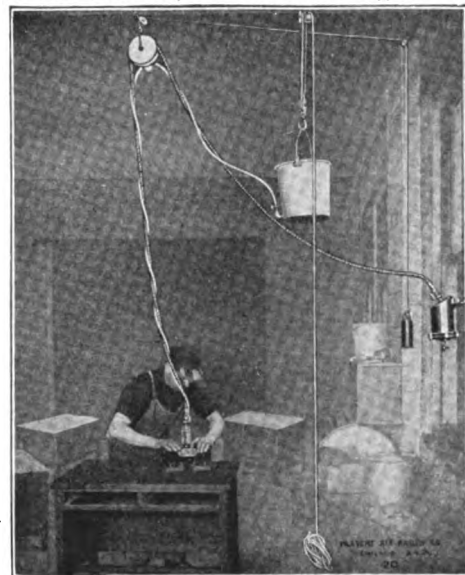
These machines are the last word in rubbing and polishing equipment. All mechanical defects have been eliminated in their construction, the wearing qualities being 200% to 300% more than any other machine for this work. They are free from vibration and noise.

Made in two sizes, as follows:

(1) Large machine, weighing 29 lbs., for flat horizontal surfaces. Used extensively by manufacturers of pianos, desks, furniture, tables, cabinets, phonographs, etc.

(2) Small machine, weighing 9 lbs., for use where a larger machine can not be conveniently used.

Send for Rubbing Machine Catalogue.



PNEUMATIC RUBBING MACHINE

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